US009560167B2

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Nakamura et al.

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(45) **Date of Patent: Jan. 31, 2017**

(54) **NETWORK SYSTEM, COMMUNICATION METHOD, SERVER, AND TERMINAL**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 170 days.

(21) Appl. No.: **14/625,395**

(22) Filed: **Feb. 18, 2015**

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(30) **Foreign Application Priority Data**

Mar. 6, 2014 (JP) 2014-043559

(51) **Int. Cl.**
G06F 15/16 (2006.01)
H04L 29/06 (2006.01)
H04L 29/08 (2006.01)

(52) **U.S. Cl.**
CPC ***H04L 67/42*** (2013.01); ***H04L 29/06*** (2013.01); ***H04L 29/08072*** (2013.01); ***H04L 67/025*** (2013.01); ***H04L 67/10*** (2013.01)

(58) **Field of Classification Search**
CPC H04L 29/06; H04L 29/08072
USPC 709/206, 220, 224, 228, 232; 370/252
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,633,649	B1 *	10/2003	Honnert	H04R 1/06 381/403
6,801,940	B1 *	10/2004	Moran	H04L 47/10 370/230
7,299,277	B1 *	11/2007	Moran	H04L 41/5022 370/230
8,185,651	B2 *	5/2012	Moran	H04L 47/10 709/224
8,621,025	B2 *	12/2013	Ridgard	H04L 67/1095 709/206
2010/0091676	A1 *	4/2010	Moran	H04L 47/10 370/252

FOREIGN PATENT DOCUMENTS

JP	2002-109097 A	4/2002
JP	2002-152723 A	5/2002
JP	2005-222225 A	8/2005
JP	2006-211236 A	8/2006
JP	2009-225481	10/2009
JP	2012-222080 A	11/2012
JP	2013-162219 A	8/2013

OTHER PUBLICATIONS

Japanese Office Action mailed Aug. 2, 2016 in JP application 2014-043559.

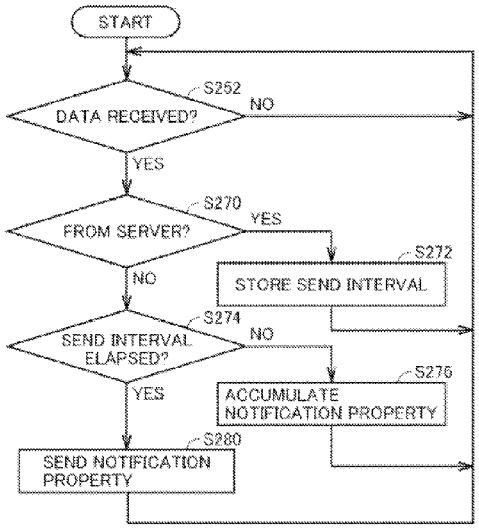
* cited by examiner

Primary Examiner — Khanh Dinh
(74) *Attorney, Agent, or Firm* — Nixon & Vanderhye P.C.

(57) **ABSTRACT**

A network system is provided that includes at least one terminal and a server. The server sends at least one terminal information for inhibiting sending of data from at least one terminal. At least one terminal each sends the server at least a part of obtained data according to the information from the server.

12 Claims, 23 Drawing Sheets



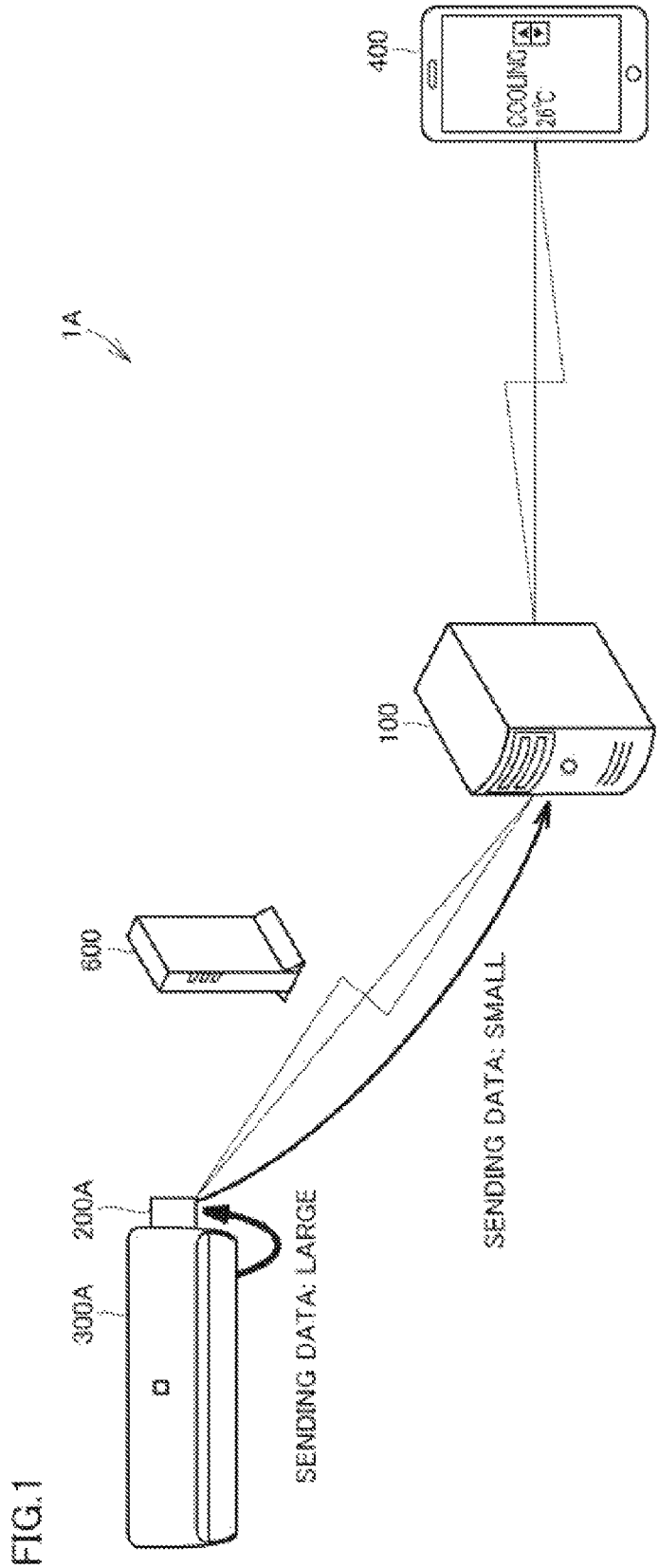

400
COOLING
16°C
1A
100
600
200A
300A
SENDING DATA: LARGE
SENDING DATA: SMALL

FIG.1

FIG.2

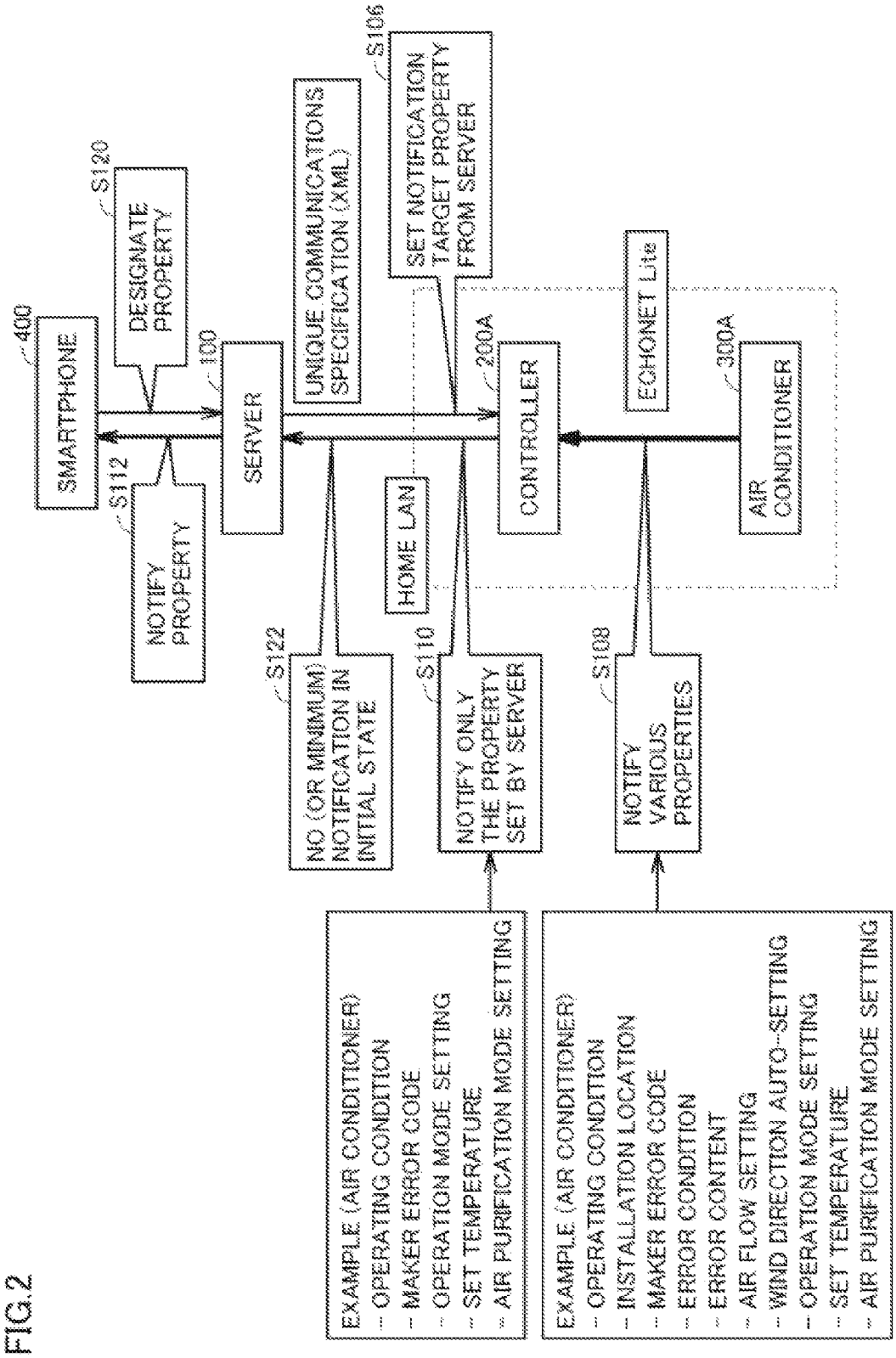

400
SMARTPHONE
S120
DESIGNATE PROPERTY
100
SERVER
S112
NOTIFY PROPERTY
UNIQUE COMMUNICATIONS SPECIFICATION (XML)
S106
SET NOTIFICATION TARGET PROPERTY FROM SERVER
200A
CONTROLLER
ECHONET Lite
300A
AIR CONDITIONER
HOME LAN
S122
NO (OR MINIMUM) NOTIFICATION IN INITIAL STATE
S110
NOTIFY ONLY THE PROPERTY SET BY SERVER
S108
NOTIFY VARIOUS PROPERTIES
EXAMPLE (AIR CONDITIONER)
- OPERATING CONDITION
- MAKER ERROR CODE
- OPERATION MODE SETTING
- SET TEMPERATURE
- AIR PURIFICATION MODE SETTING
EXAMPLE (AIR CONDITIONER)
- OPERATING CONDITION
- INSTALLATION LOCATION
- MAKER ERROR CODE
- ERROR CONDITION
- ERROR CONTENT
- AIR FLOW SETTING
- WIND DIRECTION AUTO-SETTING
- OPERATION MODE SETTING
- SET TEMPERATURE
- AIR PURIFICATION MODE SETTING

FIG.3

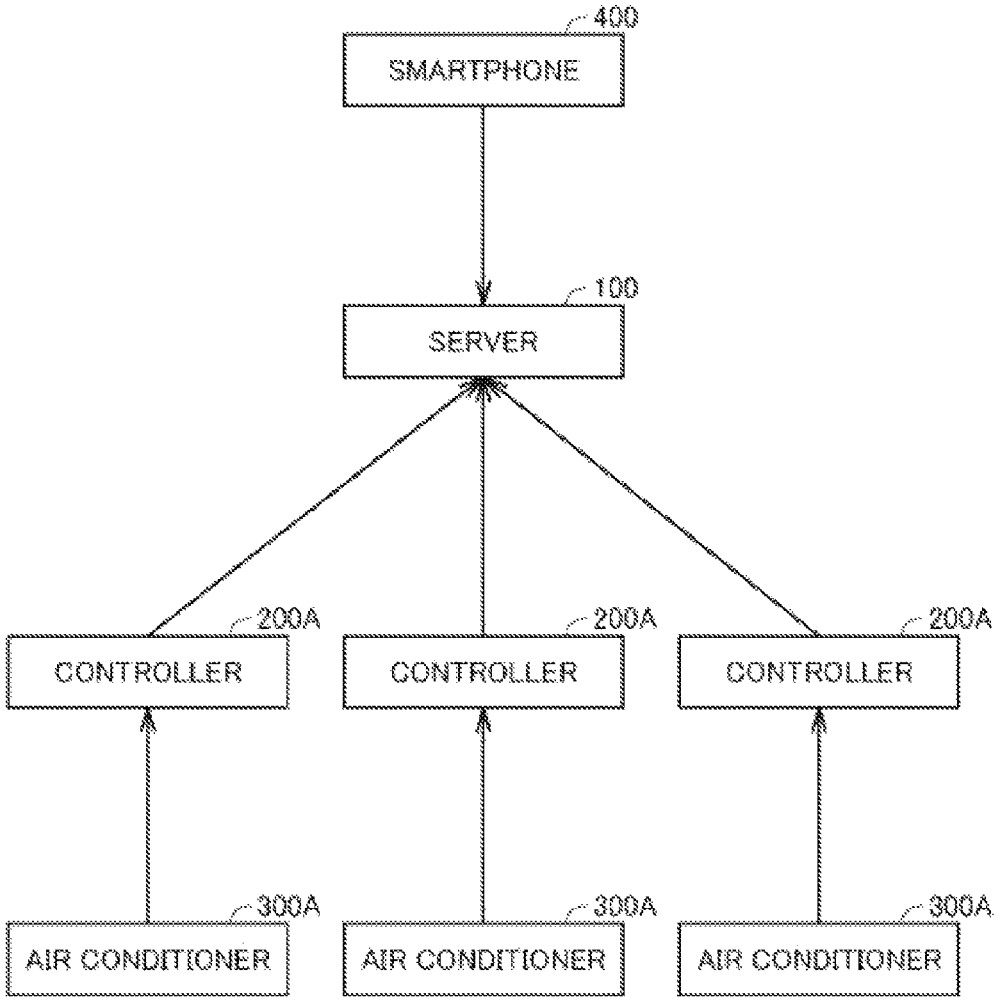

400
SMARTPHONE
100
SERVER
200A
CONTROLLER
200A
CONTROLLER
200A
CONTROLLER
300A
AIR CONDITIONER
300A
AIR CONDITIONER
300A
AIR CONDITIONER

FIG.4

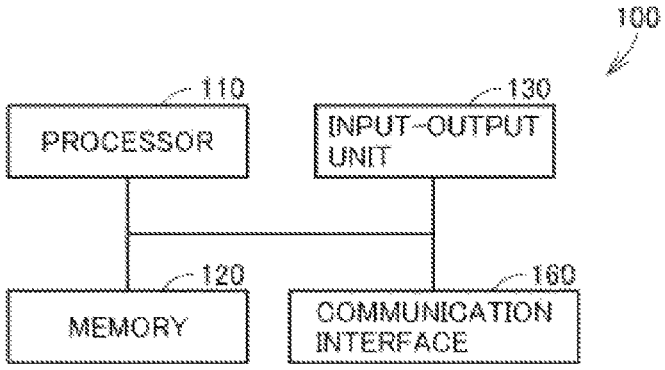

100
110
PROCESSOR
130
INPUT-OUTPUT UNIT
120
MEMORY
160
COMMUNICATION INTERFACE

FIG.5

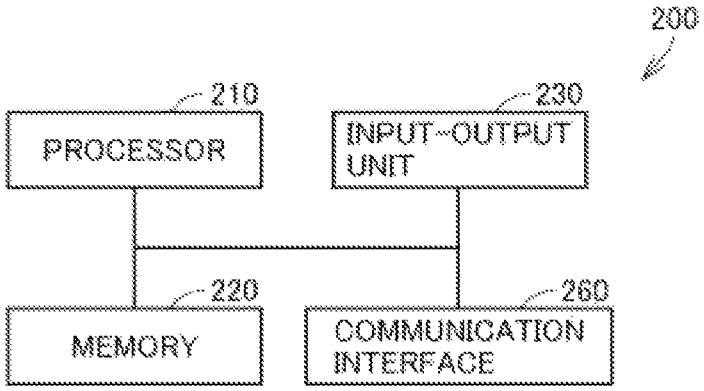

200
210
PROCESSOR
230
INPUT-OUTPUT UNIT
220
MEMORY
260
COMMUNICATION INTERFACE

FIG.6

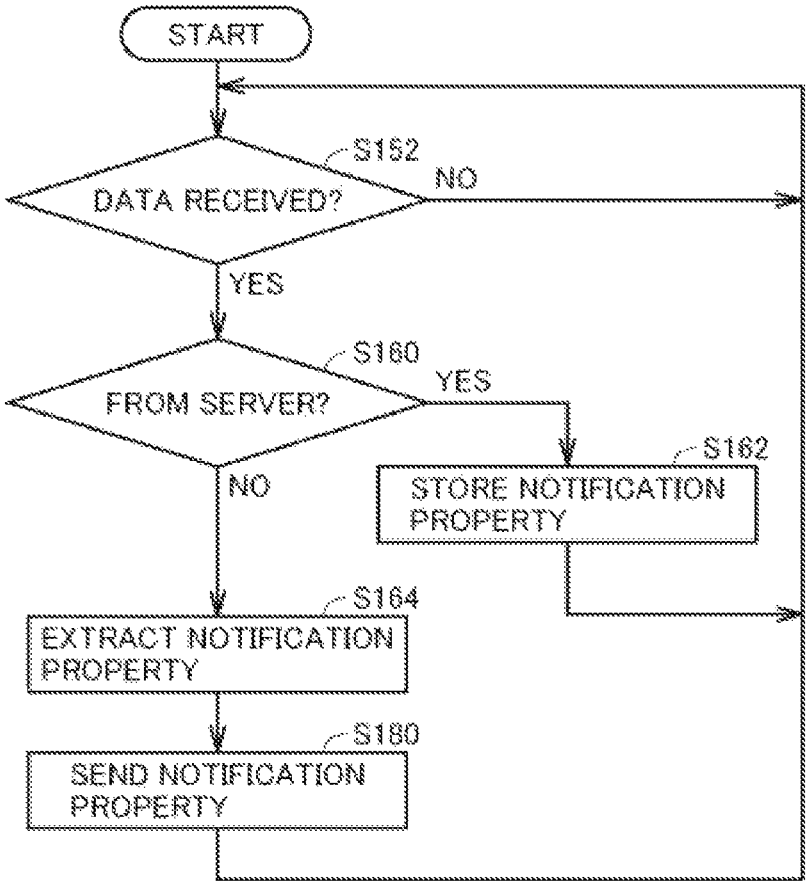

START
S152
DATA RECEIVED?
NO
YES
S160
FROM SERVER?
YES
NO
S162
STORE NOTIFICATION PROPERTY
S164
EXTRACT NOTIFICATION PROPERTY
S180
SEND NOTIFICATION PROPERTY

FIG.7

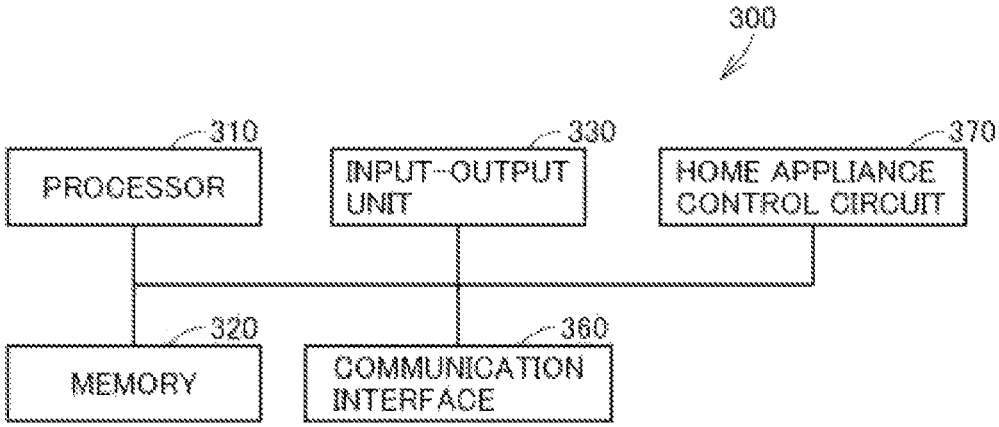
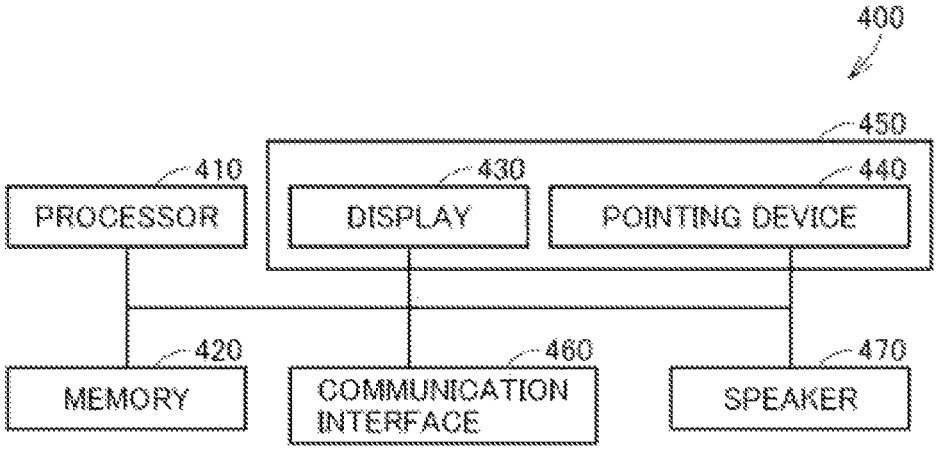

300
310
PROCESSOR
330
INPUT-OUTPUT UNIT
370
HOME APPLIANCE CONTROL CIRCUIT
320
MEMORY
360
COMMUNICATION INTERFACE

FIG.8


400
450
410
PROCESSOR
430
DISPLAY
440
POINTING DEVICE
420
MEMORY
460
COMMUNICATION INTERFACE
470
SPEAKER

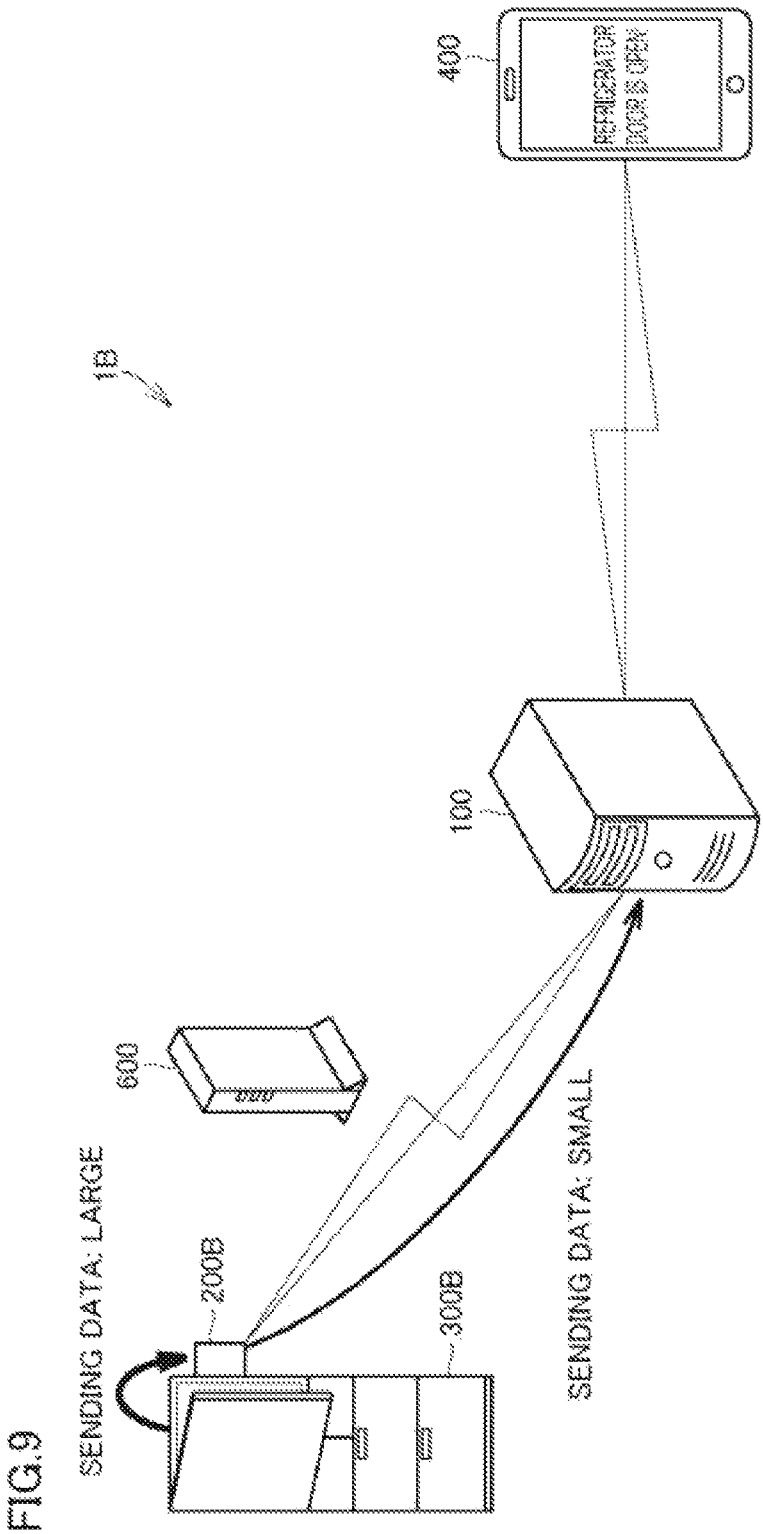
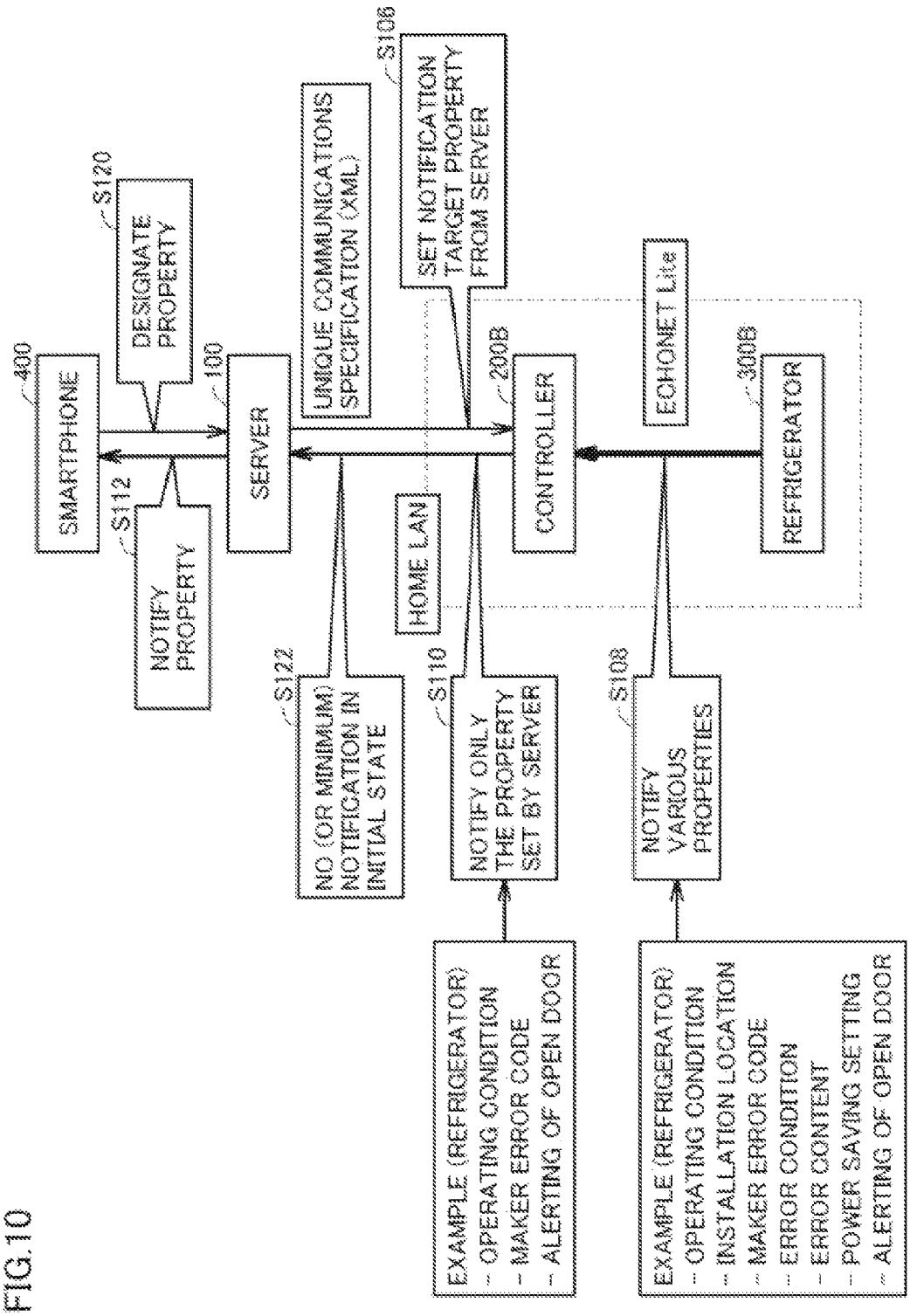

1B
400
REFRIGERATOR DOOR IS OPEN
100
600
200B
300B
SENDING DATA: LARGE
SENDING DATA: SMALL

FIG.9

FIG.10


400
SMARTPHONE
S120
DESIGNATE PROPERTY
100
SERVER
S106
UNIQUE COMMUNICATIONS SPECIFICATION (XML)
SET NOTIFICATION TARGET PROPERTY FROM SERVER
200B
CONTROLLER
ECHONET Lite
300B
REFRIGERATOR
S112
NOTIFY PROPERTY
HOME LAN
S122
NO (OR MINIMUM) NOTIFICATION IN INITIAL STATE
S110
NOTIFY ONLY THE PROPERTY SET BY SERVER
S108
NOTIFY VARIOUS PROPERTIES
EXAMPLE (REFRIGERATOR)
- OPERATING CONDITION
- MAKER ERROR CODE
- ALERTING OF OPEN DOOR
EXAMPLE (REFRIGERATOR)
- OPERATING CONDITION
- INSTALLATION LOCATION
- MAKER ERROR CODE
- ERROR CONDITION
- ERROR CONTENT
- POWER SAVING SETTING
- ALERTING OF OPEN DOOR

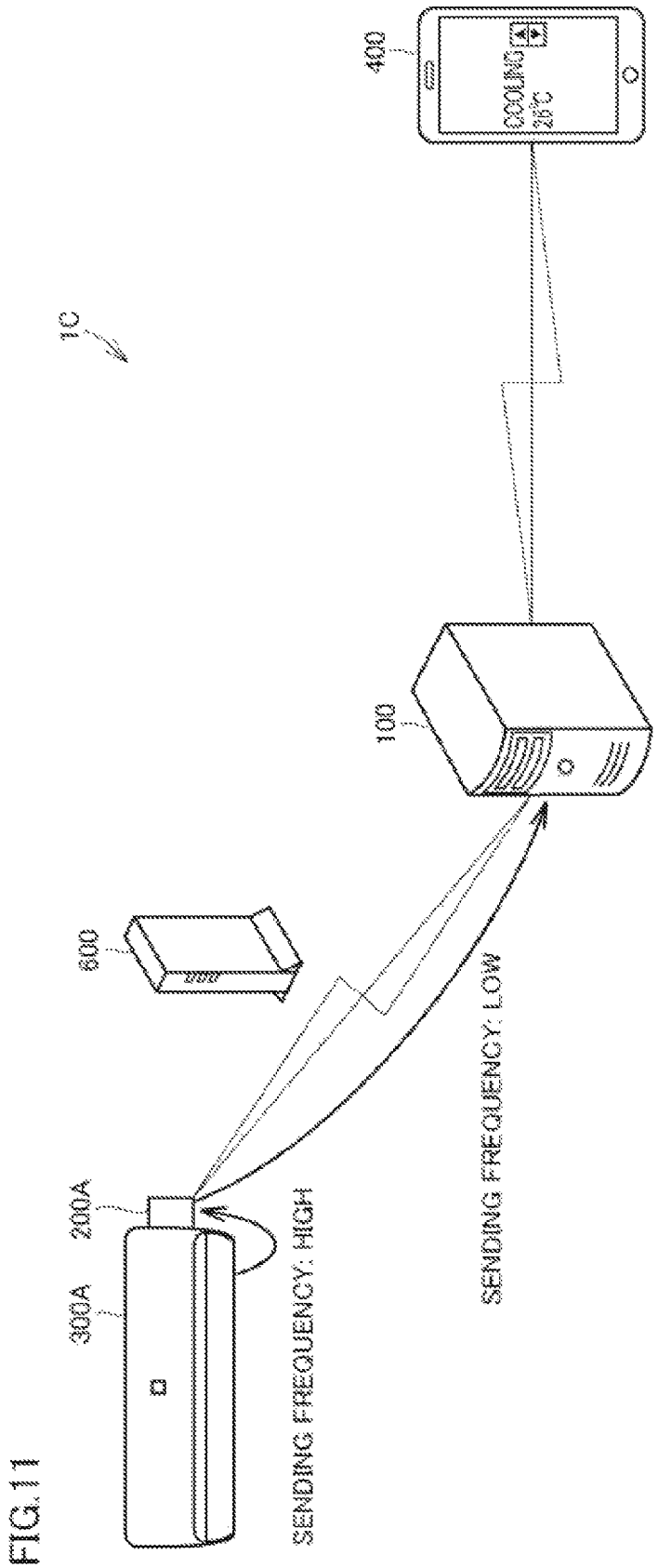

1C
400
COOLING
26°C
100
600
200A
300A
SENDING FREQUENCY: HIGH
SENDING FREQUENCY: LOW

FIG.11

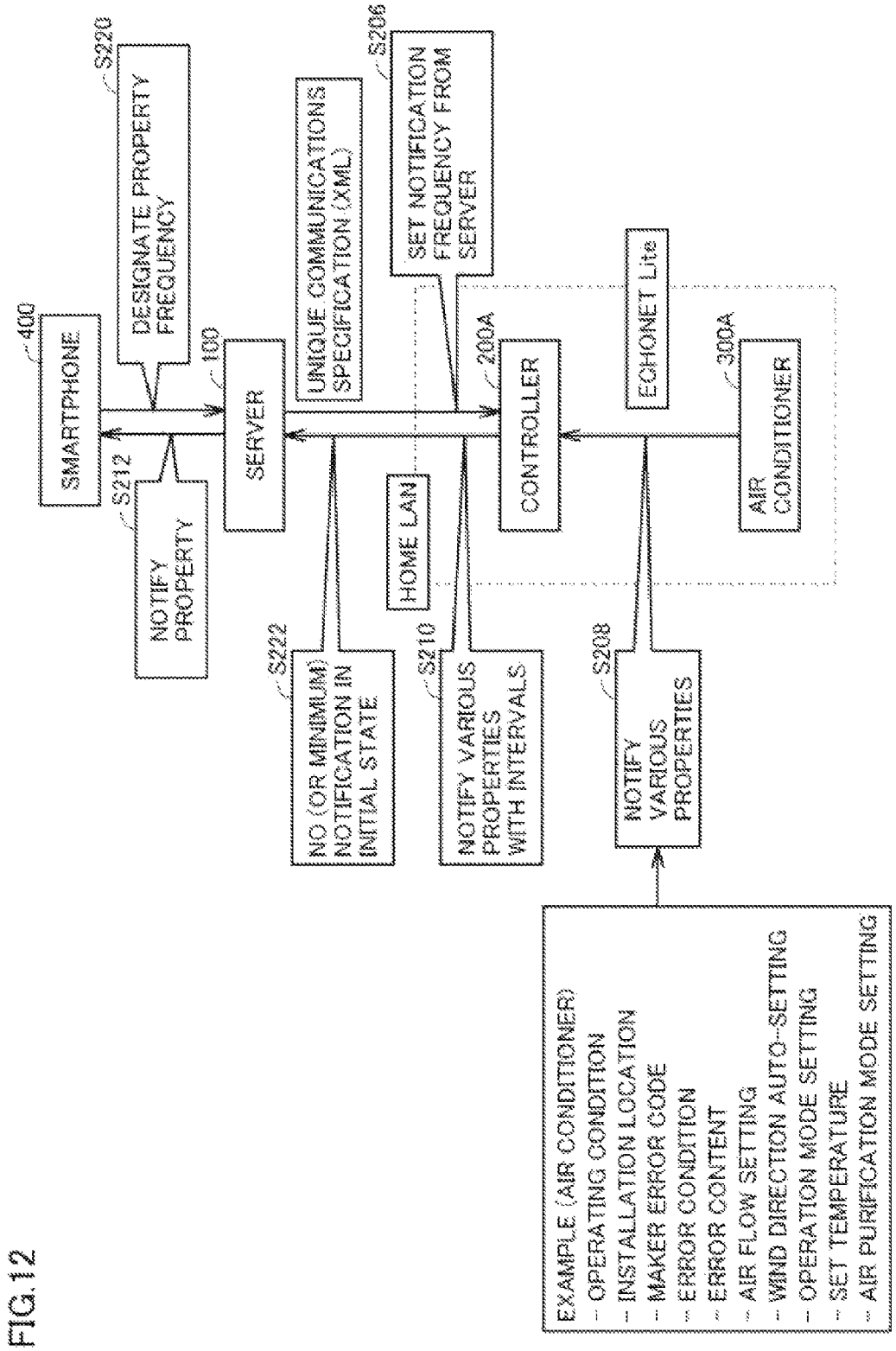
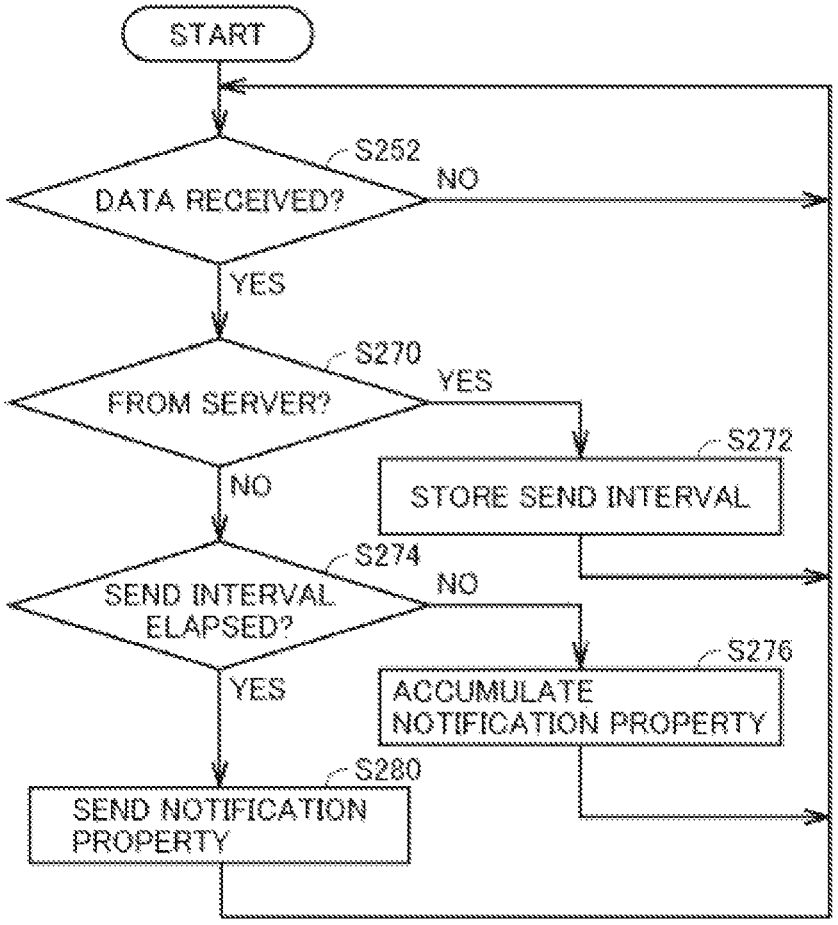

400
SMARTPHONE
S220
DESIGNATE PROPERTY FREQUENCY
S212
NOTIFY PROPERTY
100
SERVER
UNIQUE COMMUNICATIONS SPECIFICATION (XML)
S206
SET NOTIFICATION FREQUENCY FROM SERVER
200A
CONTROLLER
ECHONET Lite
300A
AIR CONDITIONER
HOME LAN
S222
NO (OR MINIMUM) NOTIFICATION IN INITIAL STATE
S210
NOTIFY VARIOUS PROPERTIES WITH INTERVALS
S208
NOTIFY VARIOUS PROPERTIES
EXAMPLE (AIR CONDITIONER)
- OPERATING CONDITION
- INSTALLATION LOCATION
- MAKER ERROR CODE
- ERROR CONDITION
- ERROR CONTENT
- AIR FLOW SETTING
- WIND DIRECTION AUTO-SETTING
- OPERATION MODE SETTING
- SET TEMPERATURE
- AIR PURIFICATION MODE SETTING

FIG.12

FIG.13


START
S252
DATA RECEIVED?
NO
YES
S270
FROM SERVER?
YES
S272
STORE SEND INTERVAL
NO
S274
SEND INTERVAL ELAPSED?
NO
S276
ACCUMULATE NOTIFICATION PROPERTY
YES
S280
SEND NOTIFICATION PROPERTY

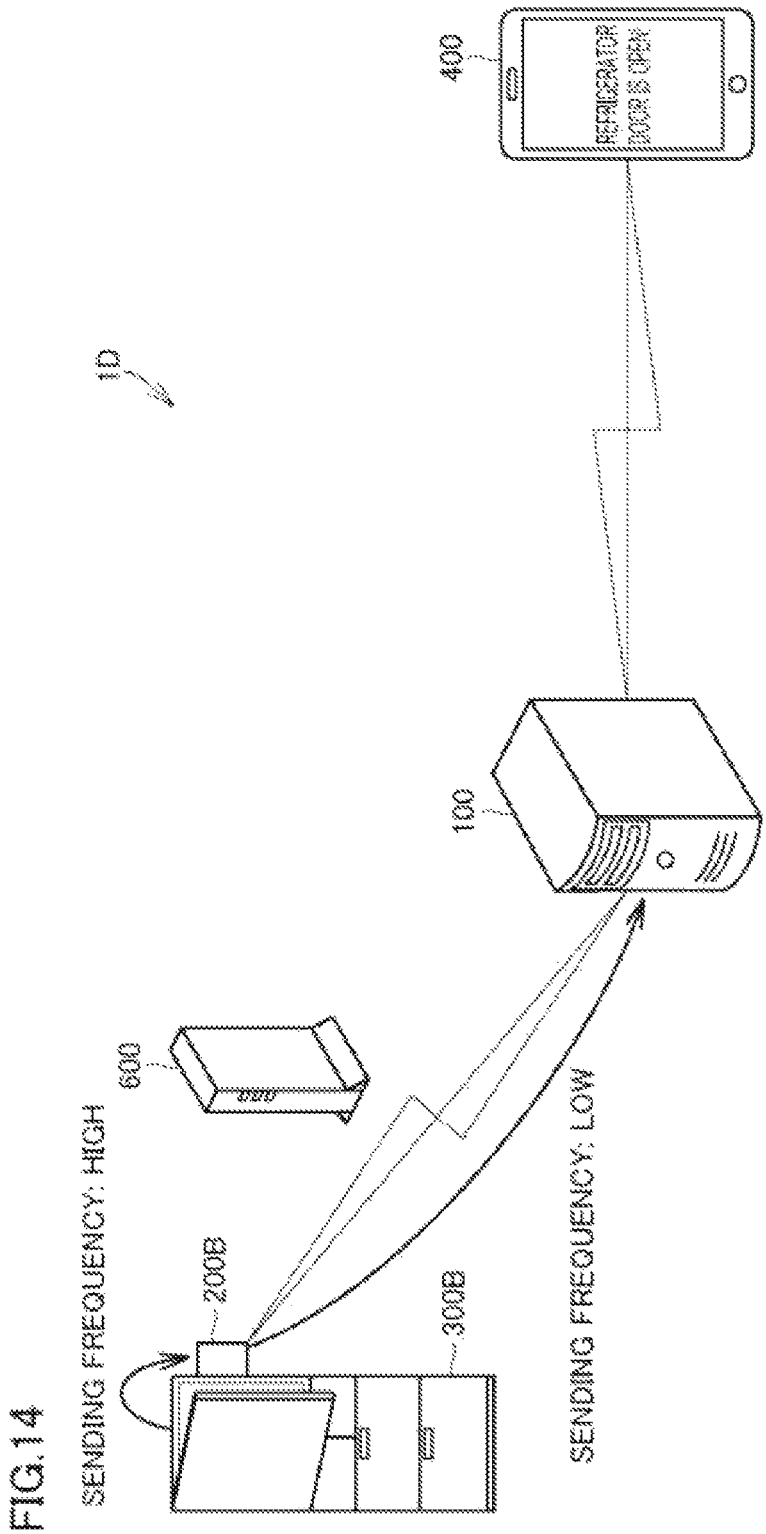

1D
400
REFRIGERATOR DOOR IS OPEN
100
600
200B
300B
SENDING FREQUENCY: HIGH
SENDING FREQUENCY: LOW

FIG.14

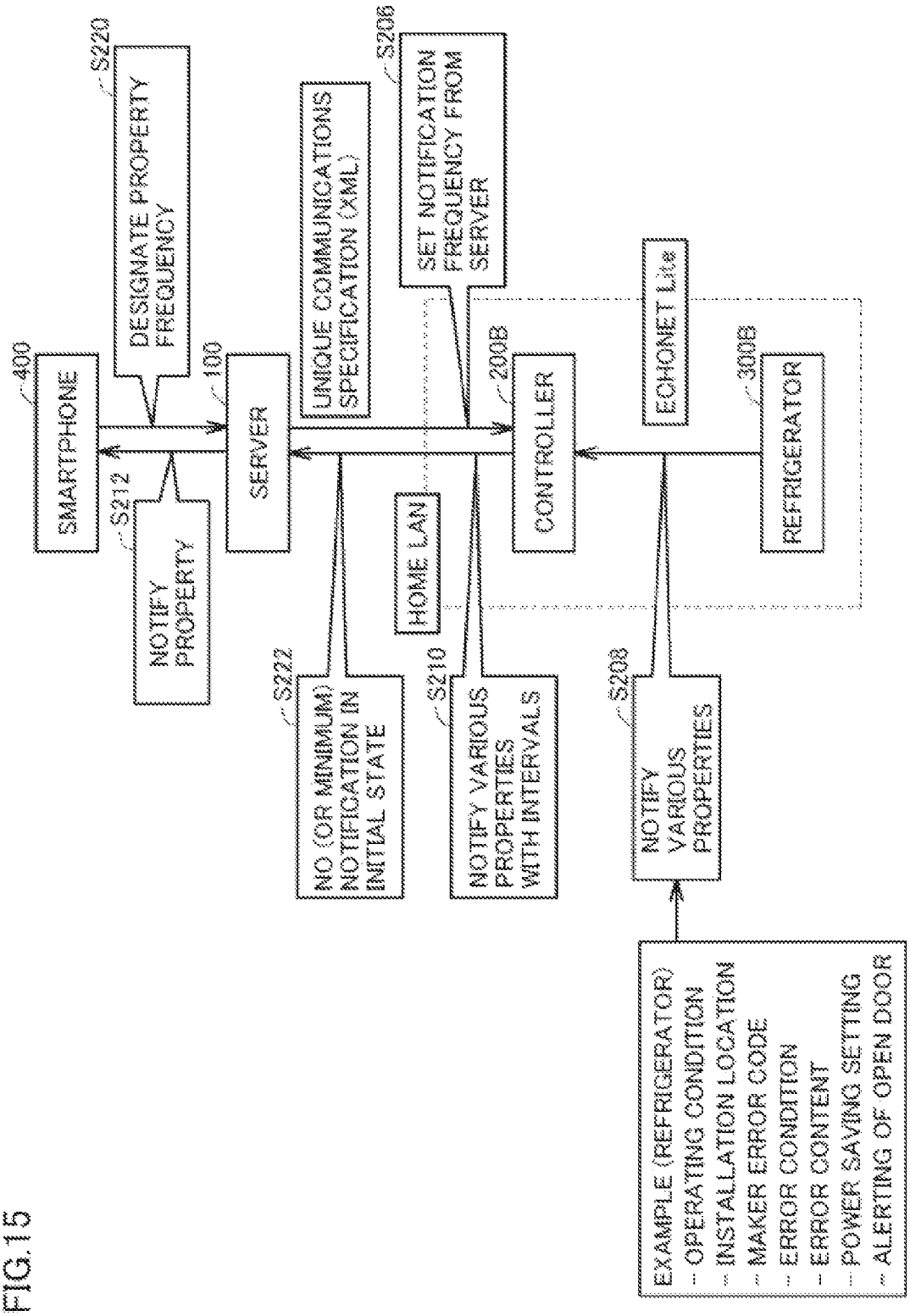

400
SMARTPHONE
S220
DESIGNATE PROPERTY FREQUENCY
100
SERVER
UNIQUE COMMUNICATIONS SPECIFICATION (XML)
S206
SET NOTIFICATION FREQUENCY FROM SERVER
200B
CONTROLLER
ECHONET Lite
300B
REFRIGERATOR
S212
NOTIFY PROPERTY
HOME LAN
S222
NO (OR MINIMUM) NOTIFICATION IN INITIAL STATE
S210
NOTIFY VARIOUS PROPERTIES WITH INTERVALS
S208
NOTIFY VARIOUS PROPERTIES
EXAMPLE (REFRIGERATOR)
- OPERATING CONDITION
- INSTALLATION LOCATION
- MAKER ERROR CODE
- ERROR CONDITION
- ERROR CONTENT
- POWER SAVING SETTING
- ALERTING OF OPEN DOOR

FIG.15

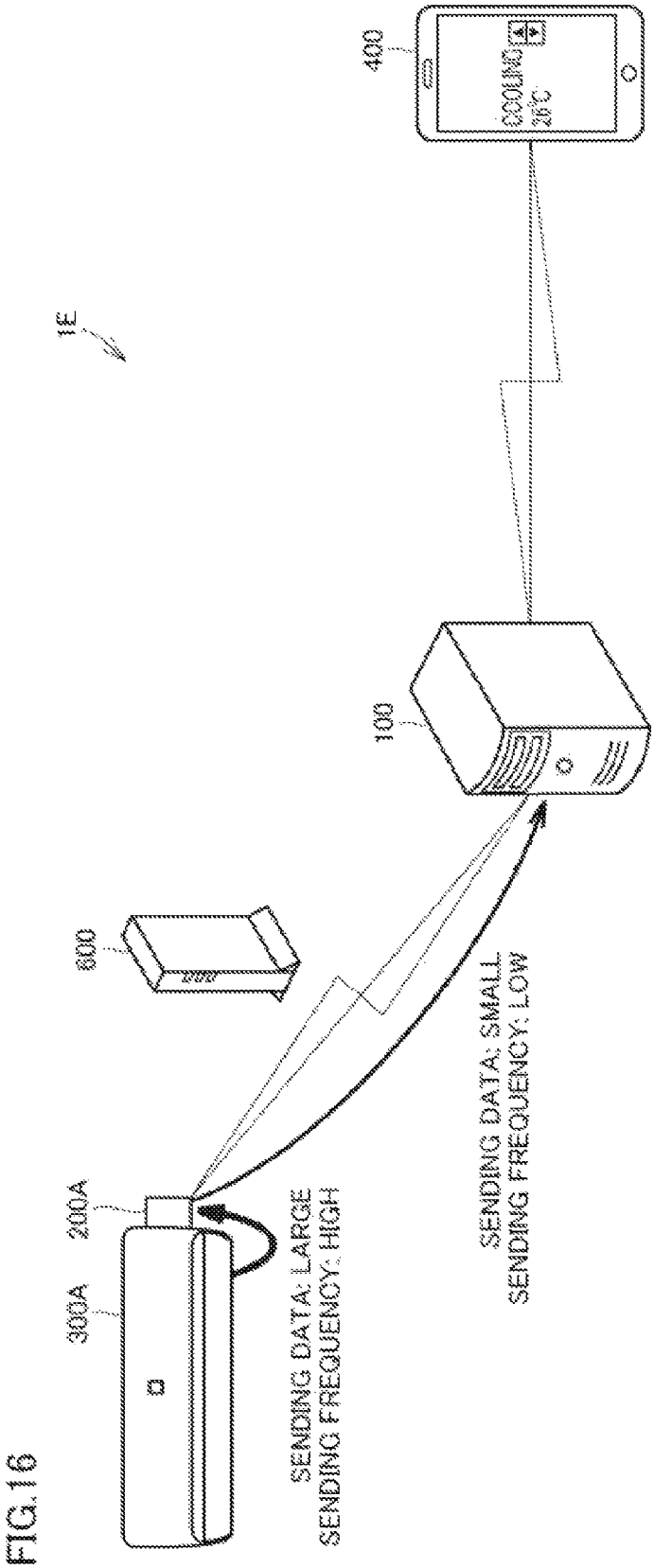

1E
400
COOLING
26°C
100
600
200A
300A
SENDING DATA: LARGE
SENDING FREQUENCY: HIGH
SENDING DATA: SMALL
SENDING FREQUENCY: LOW

FIG.16

FIG.17

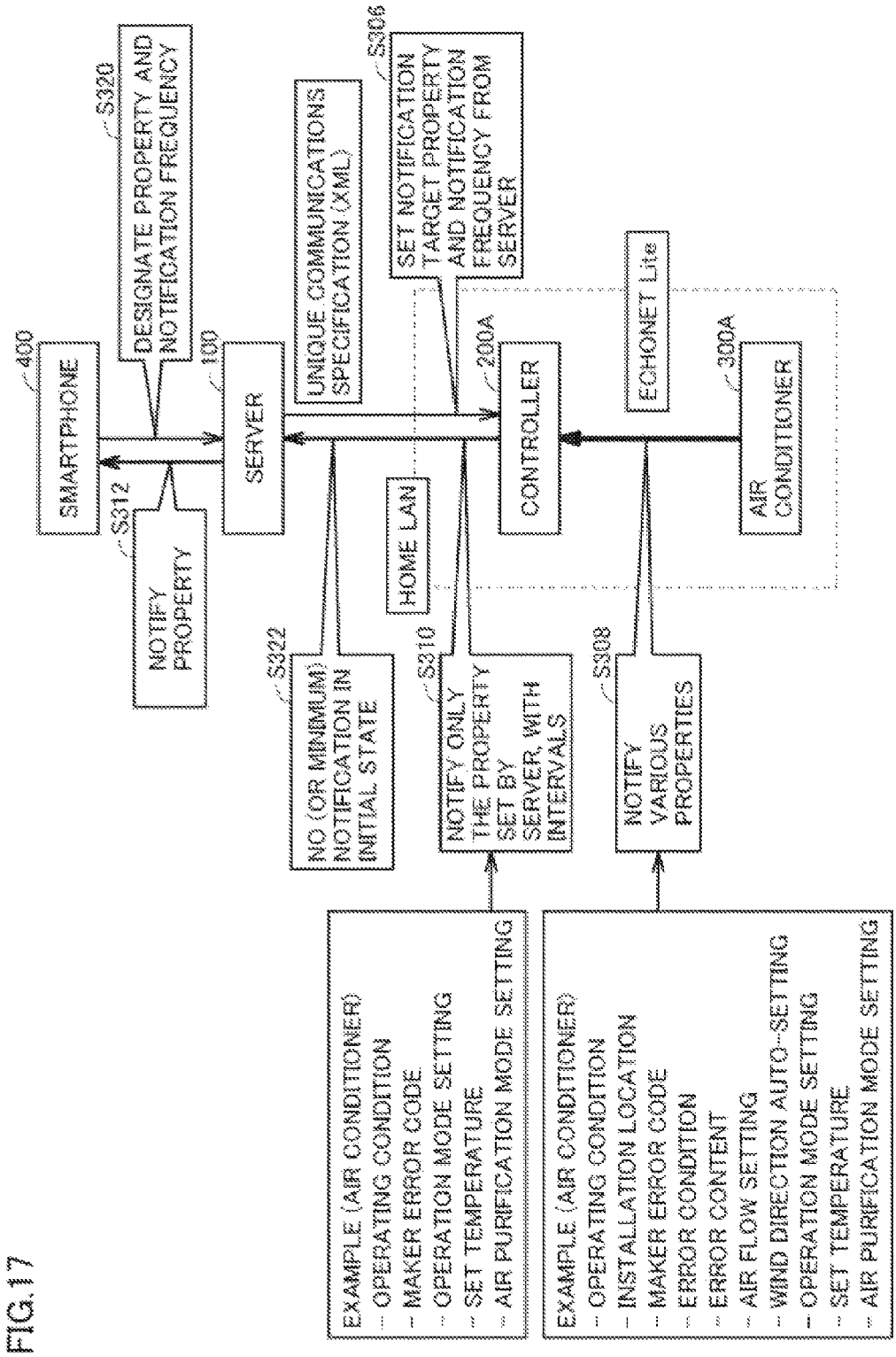
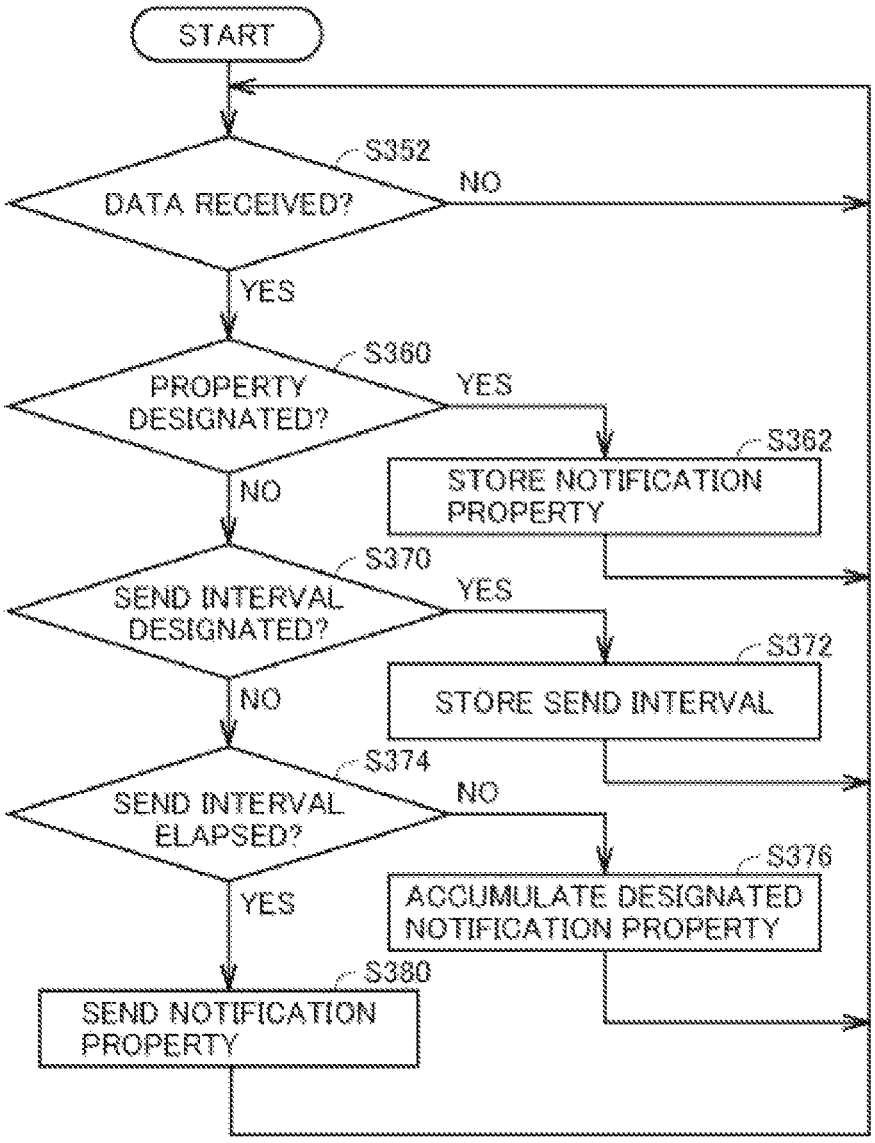

400
SMARTPHONE
S320
DESIGNATE PROPERTY AND NOTIFICATION FREQUENCY
100
SERVER
UNIQUE COMMUNICATIONS SPECIFICATION (XML)
S306
SET NOTIFICATION TARGET PROPERTY AND NOTIFICATION FREQUENCY FROM SERVER
S312
NOTIFY PROPERTY
HOME LAN
200A
CONTROLLER
ECHONET Lite
300A
AIR CONDITIONER
S322
NO (OR MINIMUM) NOTIFICATION IN INITIAL STATE
S310
NOTIFY ONLY THE PROPERTY SET BY SERVER, WITH INTERVALS
S308
NOTIFY VARIOUS PROPERTIES
EXAMPLE (AIR CONDITIONER)
- OPERATING CONDITION
- MAKER ERROR CODE
- OPERATION MODE SETTING
- SET TEMPERATURE
- AIR PURIFICATION MODE SETTING
EXAMPLE (AIR CONDITIONER)
- OPERATING CONDITION
- INSTALLATION LOCATION
- MAKER ERROR CODE
- ERROR CONDITION
- ERROR CONTENT
- AIR FLOW SETTING
- WIND DIRECTION AUTO-SETTING
- OPERATION MODE SETTING
- SET TEMPERATURE
- AIR PURIFICATION MODE SETTING

FIG.18


START
S352
DATA RECEIVED?
NO
YES
S360
PROPERTY DESIGNATED?
YES
S362
STORE NOTIFICATION PROPERTY
NO
S370
SEND INTERVAL DESIGNATED?
YES
S372
STORE SEND INTERVAL
NO
S374
SEND INTERVAL ELAPSED?
NO
S376
ACCUMULATE DESIGNATED NOTIFICATION PROPERTY
YES
S380
SEND NOTIFICATION PROPERTY

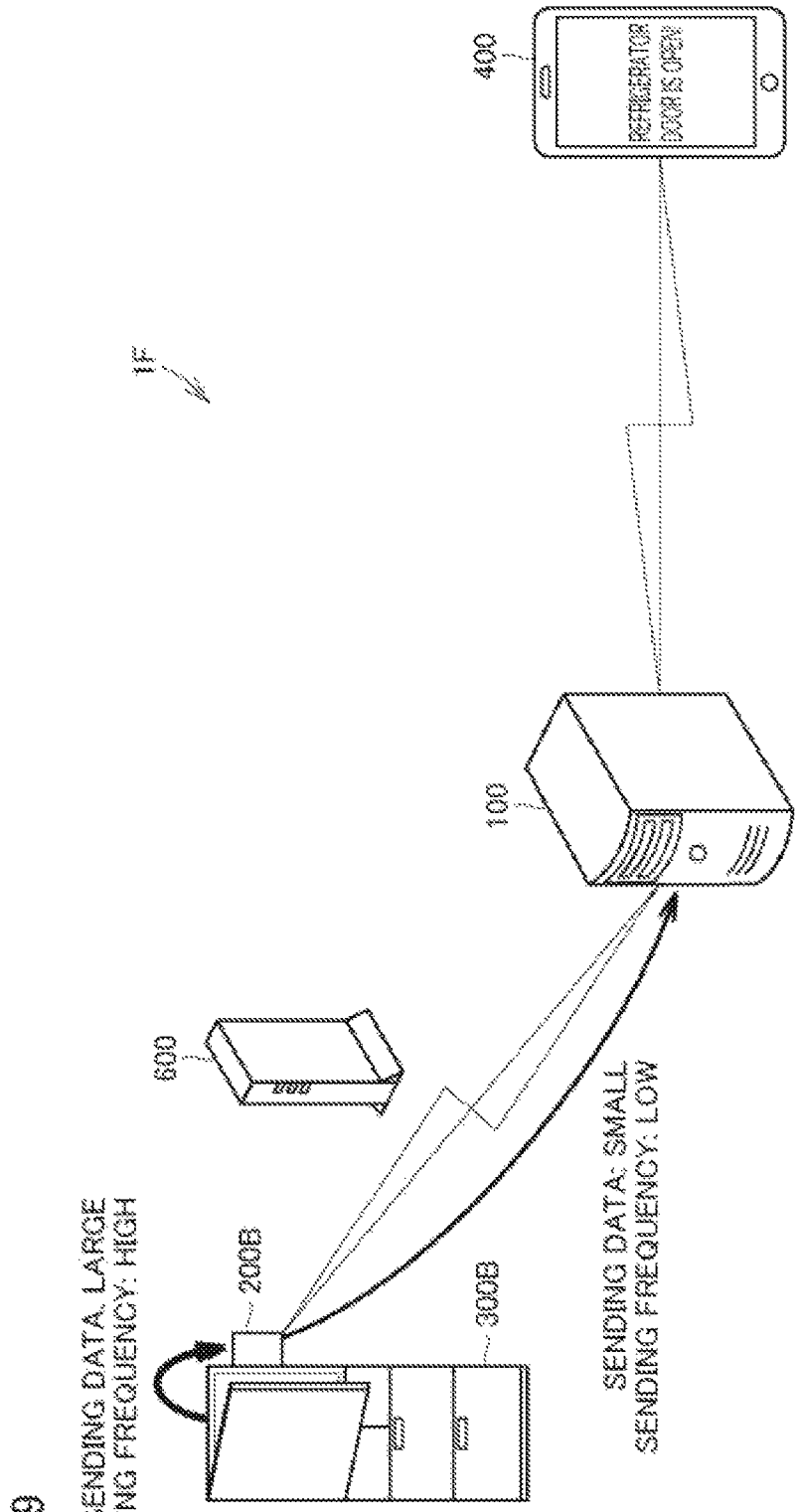
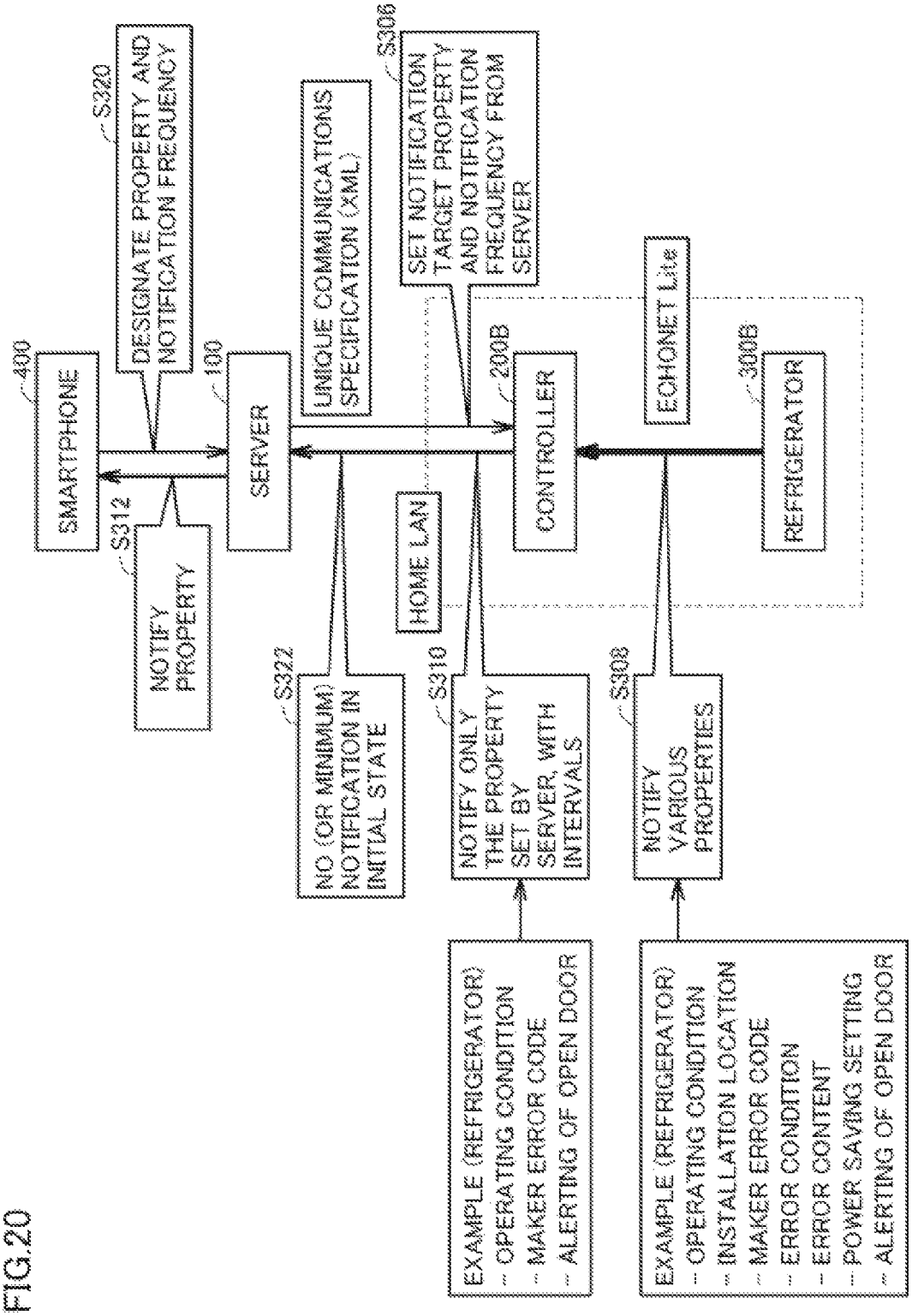

400
REFRIGERATOR DOOR IS OPEN
1F
100
600
SENDING DATA: SMALL
SENDING FREQUENCY: LOW
200B
300B
SENDING DATA: LARGE
SENDING FREQUENCY: HIGH

FIG.19

FIG.20


400
SMARTPHONE
S320
DESIGNATE PROPERTY AND NOTIFICATION FREQUENCY
100
SERVER
UNIQUE COMMUNICATIONS SPECIFICATION (XML)
S306
SET NOTIFICATION TARGET PROPERTY AND NOTIFICATION FREQUENCY FROM SERVER
200B
CONTROLLER
ECHONET Lite
300B
REFRIGERATOR
S312
NOTIFY PROPERTY
HOME LAN
S322
NO (OR MINIMUM) NOTIFICATION IN INITIAL STATE
S310
NOTIFY ONLY THE PROPERTY SET BY SERVER, WITH INTERVALS
S308
NOTIFY VARIOUS PROPERTIES
EXAMPLE (REFRIGERATOR)
- OPERATING CONDITION
- MAKER ERROR CODE
- ALERTING OF OPEN DOOR
EXAMPLE (REFRIGERATOR)
- OPERATING CONDITION
- INSTALLATION LOCATION
- MAKER ERROR CODE
- ERROR CONDITION
- ERROR CONTENT
- POWER SAVING SETTING
- ALERTING OF OPEN DOOR

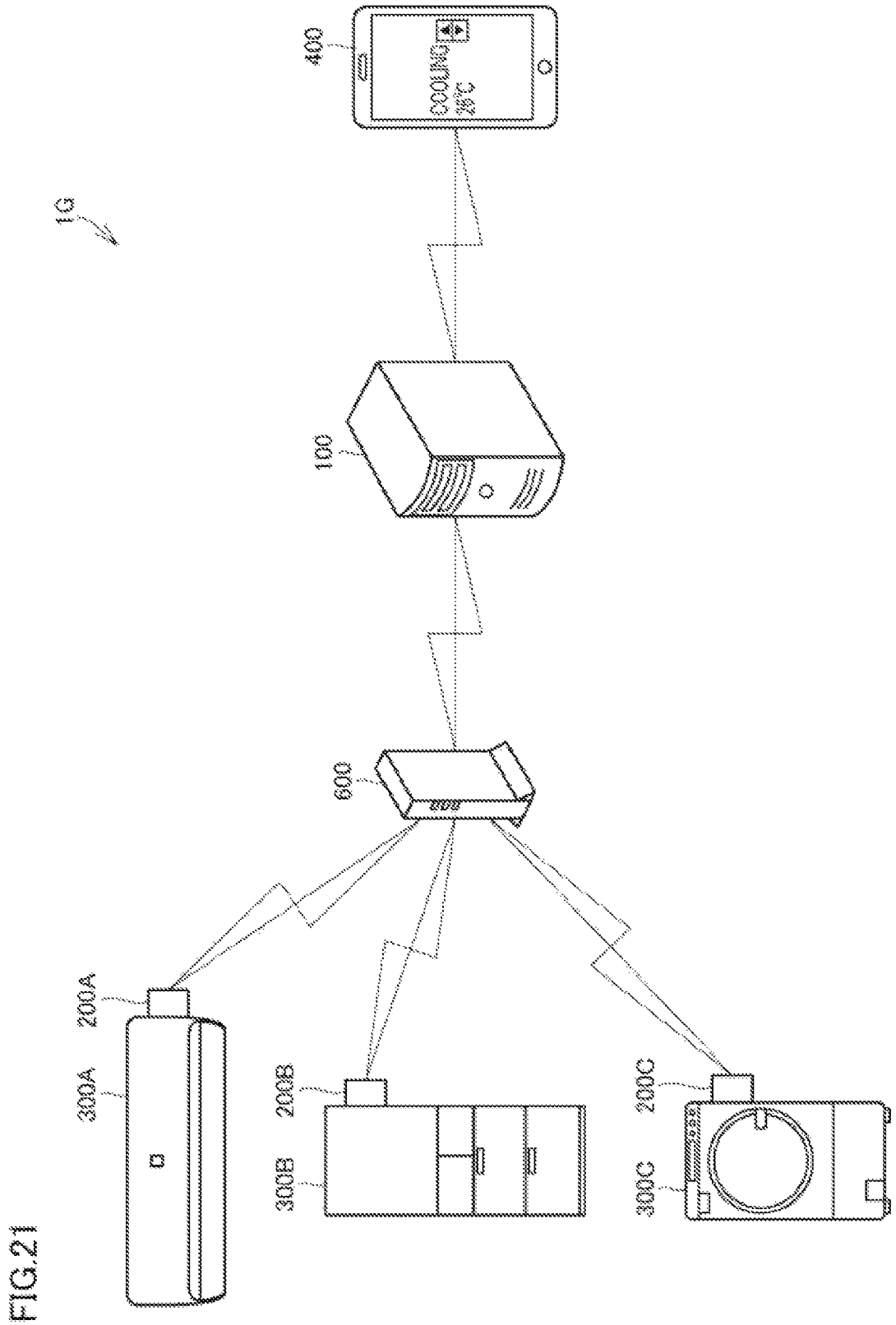
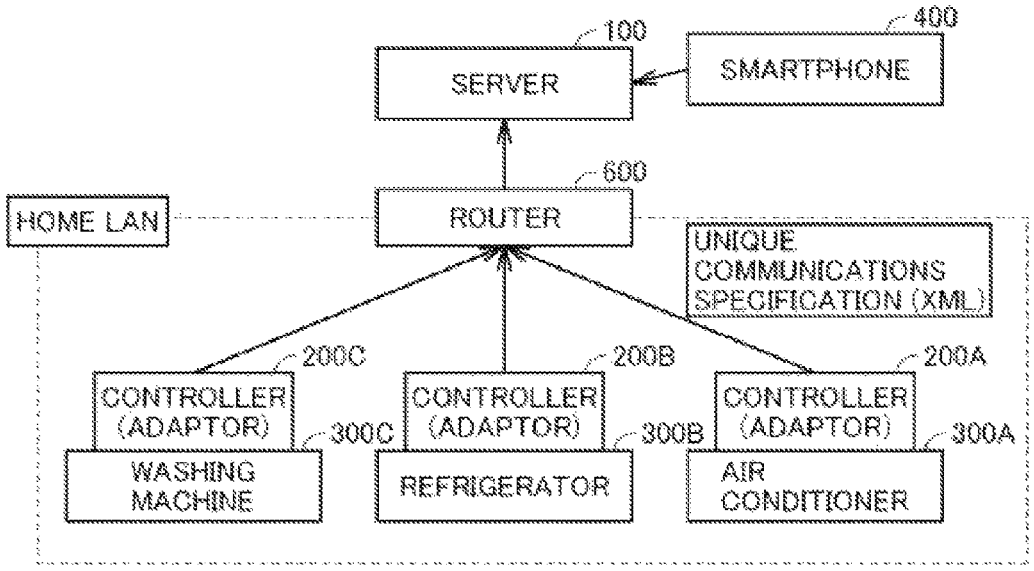


FIG.21

FIG.22


100
SERVER
400
SMARTPHONE
600
ROUTER
HOME LAN
UNIQUE COMMUNICATIONS SPECIFICATION (XML)
200C
CONTROLLER (ADAPTOR)
200B
CONTROLLER (ADAPTOR)
200A
CONTROLLER (ADAPTOR)
300C
WASHING MACHINE
300B
REFRIGERATOR
300A
AIR CONDITIONER

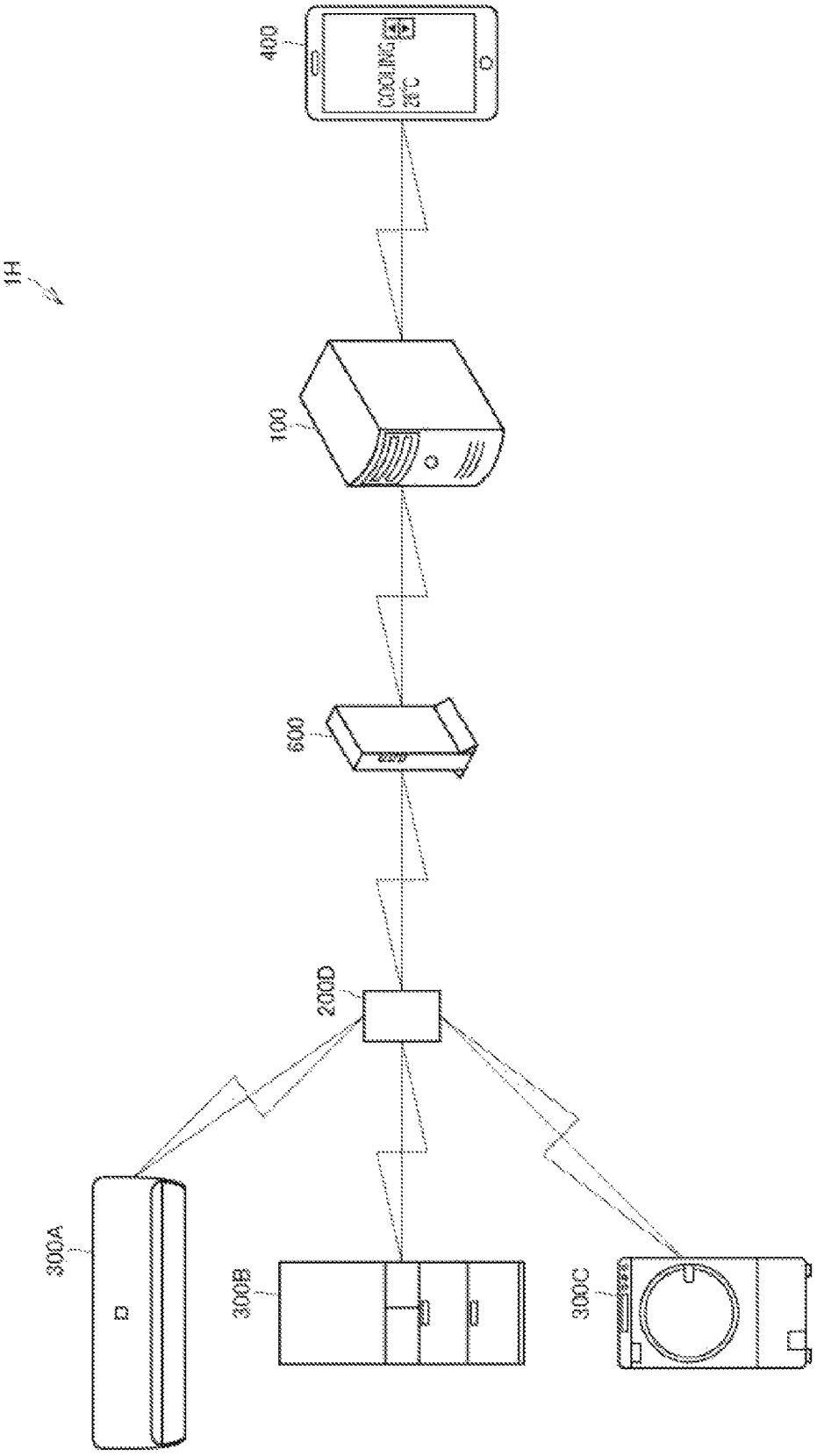


FIG.23

FIG.24

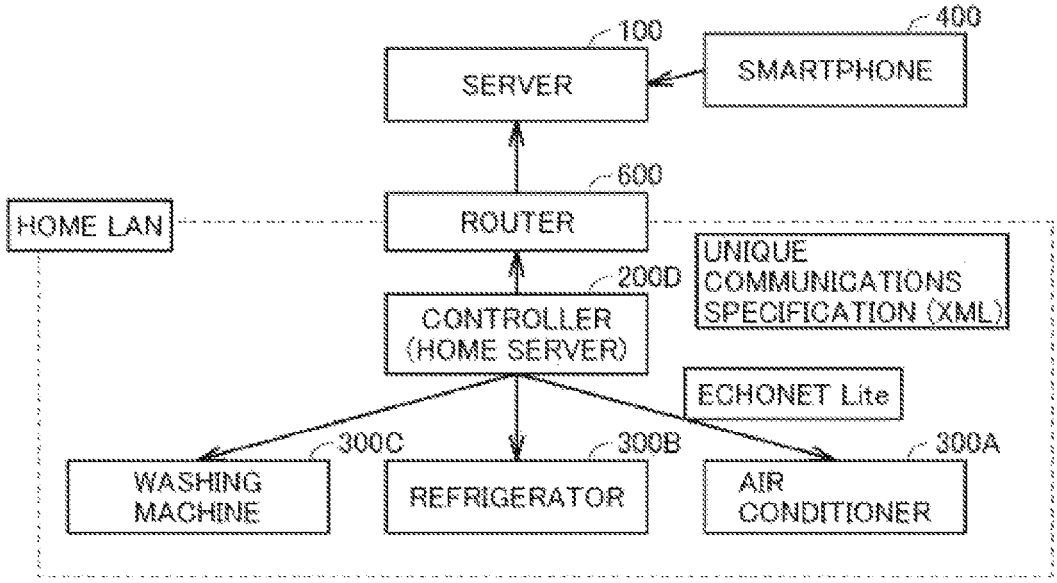

100
SERVER
400
SMARTPHONE
600
ROUTER
HOME LAN
UNIQUE COMMUNICATIONS SPECIFICATION (XML)
200D
CONTROLLER (HOME SERVER)
ECHONET Lite
300C
WASHING MACHINE
300B
REFRIGERATOR
300A
AIR CONDITIONER

FIG.25

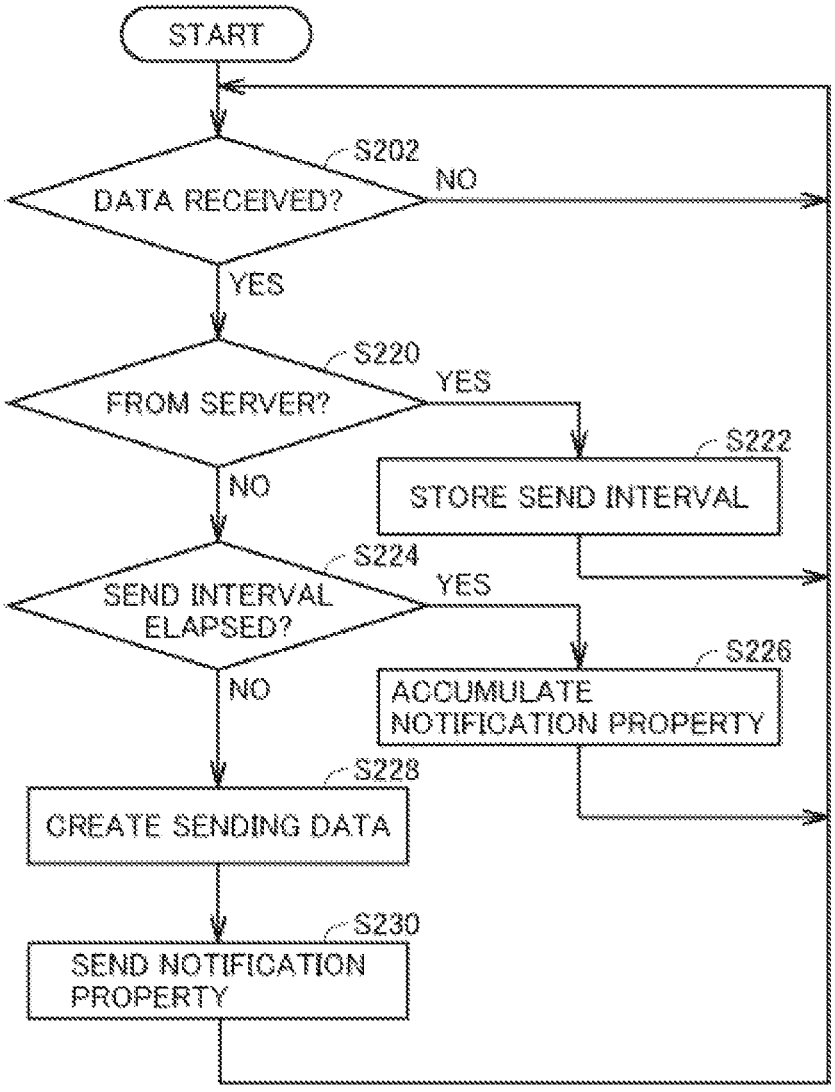
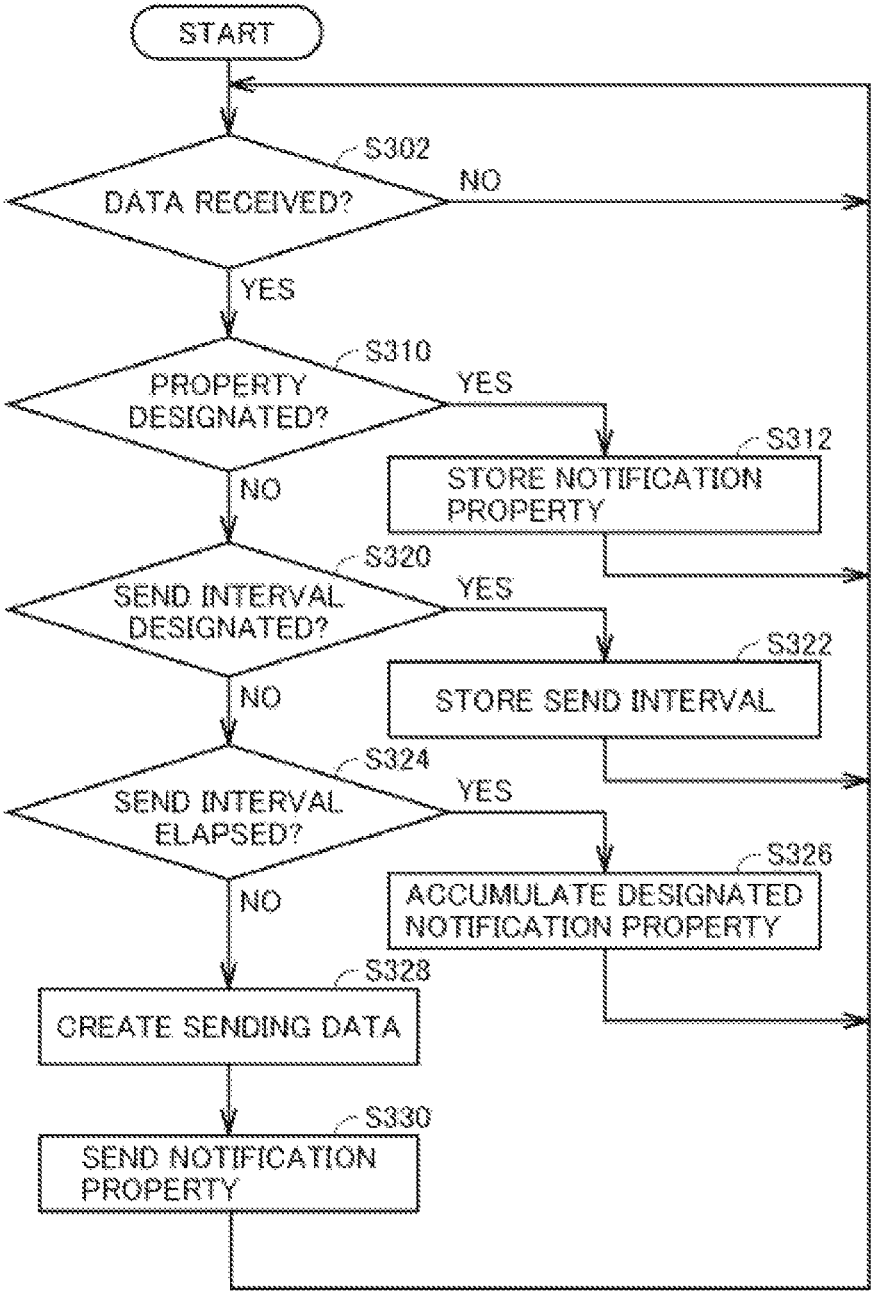

START
S202
DATA RECEIVED?
NO
YES
S220
FROM SERVER?
YES
S222
STORE SEND INTERVAL
NO
S224
SEND INTERVAL ELAPSED?
YES
S226
ACCUMULATE NOTIFICATION PROPERTY
NO
S228
CREATE SENDING DATA
S230
SEND NOTIFICATION PROPERTY

FIG.26


START
S302
DATA RECEIVED?
NO
YES
S310
PROPERTY DESIGNATED?
YES
S312
STORE NOTIFICATION PROPERTY
NO
S320
SEND INTERVAL DESIGNATED?
YES
S322
STORE SEND INTERVAL
NO
S324
SEND INTERVAL ELAPSED?
YES
S326
ACCUMULATE DESIGNATED NOTIFICATION PROPERTY
NO
S328
CREATE SENDING DATA
S330
SEND NOTIFICATION PROPERTY

NETWORK SYSTEM, COMMUNICATION METHOD, SERVER, AND TERMINAL

This application priority to Japanese Patent Application No. 2014-043559, filed 6 Mar. 2014, the entire contents of which is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a network system technology, specifically a network system used to control home appliances, and to a communication method, a server, and a terminal.

Description of the Related Art

Network systems used to control home appliances are known. For example, JP-A-2009-225481 discloses a communication device, a communication control method, and a communication control program. This publication discloses an adaptor that connects an electrical device to an ECHONET network. The adaptor includes a device object storing section that stores the object configuration information of a connecting electrical device in advance, an object configuration checking section that checks whether the object configuration information stored in the device object storing section matches the object configuration information obtained from a connected electrical device, and a network entry processing section that communicatably connects the electrical device and the ECHONET network to each other if the object configuration checking section determined that the object configuration information matches.

There has been proposed a communication protocol called ECHONET Lite. ECHONET Lite encompasses a control protocol and a protocol for a sensor network for smart houses, and has been internationally certified under ISO and IEC standards. For example, the Ministry of Economy, Trade and Industry in Japan certifies ECHONET Lite as a standard protocol for connecting a smart meter and an HEMS (Home Energy Management System).

However, sending of data from a home appliance to a server has the possibility of creating heavy traffic from the home appliance to the server, or overloading the server, when the data is sent directly to the server.

SUMMARY OF INVENTION

It is an object of the present invention to reduce the possibility of creating heavy traffic from a home appliance to a server, or the possibility of overloading a server.

According to some aspects of the present invention, there is provided a network system that includes at least one terminal and a server. The server sends the at least one terminal information for inhibiting sending of data from the at least one terminal. The at least one terminal each sends the server at least a part of obtained data according to the information from the server.

Preferably, the server sends first information for designating a time interval for sending data as the information, to the at least one terminal.

Preferably, the at least one terminal accumulates unsent data from the obtained data, creates data indicative of a difference in the plurality of accumulated data, and sends the data indicative of the difference to the server according to the first information.

Preferably, the at least one terminal sends the server only the most recent data in unsent data from the obtained data according to the first information.

Preferably, the server sends second information for designating a type of data to be sent as the information, to the at least one terminal.

Preferably, the server accepts a designation of a required data type from other terminal, and sends the second information to the at least one terminal according to the designated data type.

Preferably, the server sends the information to the at least one terminal when a predetermined condition is satisfied, and does not send the information to the at least one terminal when the predetermined condition is not satisfied.

Preferably, the server sends the information to the at least one terminal under the predetermined condition that a server load exceeds a predetermined value, and does not send the information to the at least one terminal under the predetermined condition that the server load does not exceed the predetermined value.

Preferably, the server sends the information to the at least one terminal under the predetermined condition that the terminal is a terminal of a non-paying member, and does not send the information to the at least one terminal under the predetermined condition that the terminal is a terminal of a paying member.

According to another aspect of the present invention, there is provided a communication method for a network system that includes at least one terminal and a server. The communication method includes: the server sending the at least one terminal information for inhibiting sending of data from the at least one terminal; and the at least one terminal each sending the server at least a part of obtained data according to the information from the server.

According to another aspect of the present invention, there is provided a server that includes:

a communication interface for communicating with at least one terminal; and

a processor for sending the at least one terminal information for inhibiting sending of data from the at least one terminal, the information being sent via the communication interface.

According to another aspect of the present invention, there is provided a communication method for a server that includes a processor and a communication interface. The communication method includes: the processor sending the at least one terminal information for inhibiting sending of data from the at least one terminal, the information being sent via the communication interface; and the processor receiving data from the at least one terminal via the communication interface.

According to another aspect of the present invention, there is provided a communication program for a server that includes a processor and a communication interface. The communication program causes the processor to perform: sending at least one terminal information for inhibiting sending of data from the at least one terminal, the information being sent via the communication interface; and receiving data from the at least one terminal via the communication interface.

According to another aspect of the present invention, there is provided a terminal that includes:

a communication interface for communicating with a server; and

a processor for receiving from the server information for inhibiting sending of data to the server, the information being received via the communication interface.

According to another aspect of the present invention, there is provided a communication method for a terminal that includes a processor and a communication interface.

The communication method includes: the processor receiving from a server information for inhibiting sending of data to the server, the information being received via the communication interface; and the processor sending data to the server via the communication interface according to the information.

According to another aspect of the present invention, there is provided a communication program for a server that includes a processor and a communication interface. The communication program causes the processor to perform: receiving from the server information for inhibiting sending of data to the server, the information being received via the communication interface; and sending data to the server via the communication interface according to the information.

The present invention is intended to reduce the possibility of creating heavy traffic from a home appliance to a server, or overloading a server, as above.

Additional features and advantages of the present disclosure will be set forth in the following detailed description. Alternatively, additional features and advantages will be readily apparent to those skilled in the art from the content of the detailed description or recognized by practicing the subject matter as described herein, including the detailed description, the claims, and the appended drawings. It is to be understood that the foregoing general description concerning the related art and the following detailed description are provided solely for illustrative purposes, and are intended to provide an overview or framework for understanding the nature and character of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic diagram representing the overall configuration of the network system **1**A according to First Embodiment.

FIG. **2** is a schematic diagram briefly representing the overall operation of the network system **1**A according to First Embodiment.

FIG. **3** is a block diagram representing the overall configuration of the network system **1**A according to First Embodiment.

FIG. **4** is a block diagram representing the hardware configuration of the server **100** according to the present embodiment.

FIG. **5** is a block diagram representing the hardware configuration of the controller **200**A according to the present embodiment.

FIG. **6** is a flowchart representing the communication process by the controller **200**A according to First Embodiment.

FIG. **7** a block diagram representing the hardware configuration of the air conditioner **300**A according to the present embodiment.

FIG. **8** a block diagram representing the hardware configuration of the smartphone **400** according to the present embodiment.

FIG. **9** is a schematic diagram representing the overall configuration of the network system **1**B according to Second Embodiment.

FIG. **10** is a schematic diagram briefly representing the overall operation of the network system **1**B according to Second Embodiment.

FIG. **11** is a schematic diagram representing the overall configuration of the network system **1**C according to Third Embodiment.

FIG. **12** is a schematic diagram briefly representing the overall operation of the network system **1**C according to Third Embodiment.

FIG. **13** is a flowchart representing the communication process by the controller **200**A according to Third Embodiment.

FIG. **14** is a schematic diagram representing the overall configuration of the network system **1**D according to Fourth Embodiment.

FIG. **15** is a schematic diagram briefly representing the overall operation of the network system **1**D according to Fourth Embodiment.

FIG. **16** is a schematic diagram representing the overall configuration of the network system **1**E according to Fifth Embodiment.

FIG. **17** is a schematic diagram briefly representing the overall operation of the network system **1**E according to Fifth Embodiment.

FIG. **18** is a flowchart representing the communication process by the controller **200**A according to Fifth Embodiment.

FIG. **19** is a schematic diagram representing the overall configuration of the network system **1**F according to Sixth Embodiment.

FIG. **20** is a schematic diagram briefly representing the overall operation of the network system **1**F according to Sixth Embodiment.

FIG. **21** is a schematic diagram representing the overall configuration of the network system **1**G according to Seventh Embodiment.

FIG. **22** is a functional block diagram representing the overall configuration of the network system **1**G according to Seventh Embodiment.

FIG. **23** is a schematic diagram representing the overall configuration of the network system **1**H according to Eighth Embodiment.

FIG. **24** is a functional block diagram representing the overall configuration of the network system **1**H according to Eighth Embodiment.

FIG. **25** is a flowchart representing the communication process by the controller **200**A according to Ninth Embodiment.

FIG. **26** is a flowchart representing the communication process by the controller **200**A according to Tenth Embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the present invention are described below with reference to the accompanying drawings. In the following descriptions, like elements are given like reference numerals. Such like elements will be referred to by the same names, and have the same functions. Accordingly, detailed descriptions of such elements will not be repeated.

First Embodiment

Overall Configuration of Network System **1**A

The overall configuration of the network system **1**A according to the present embodiment is described below. FIG. **1** is a schematic diagram representing the overall configuration of the network system **1**A according to the present embodiment.

Referring to FIG. **1**, the network system **1**A according to the present embodiment includes an air conditioner **300**A

disposed as a home appliance in locations such as homes and offices, a controller **200**A provided as a first terminal that enables data communications with the air conditioner **300**A, a server **100** that enables data communications with the controller **200**A, and a smartphone **400** provided as a second terminal that enables data communications with the server **100**.

The following present embodiment will be described through the case where the home appliance is the air conditioner **300**A. However, the home appliance may be, for example, a refrigerator as in Second Embodiment, or some other device such as a vacuum cleaner, a television, a washing machine, a rice cooker, an air purifier, a floor heating system, and an IH (Induction Heating) cooking heater. The air conditioner **300**A can send and receive data to and from the controller **200**A via a wired or a wireless connection.

The present embodiment will be described through the case where the first terminal is the controller **200**A separately provided from the air conditioner **300**A. The controller **200**A can send and receive data to and from the air conditioner **300**A via a wired or a wireless connection. The controller **200**A also can send and receive data to and from the server **100** via a wired or a wireless connection.

The present embodiment will be described through the case where the second terminal is any of the smartphones **400** owned by users of the air conditioner **300**A. The smartphone **400** enables controlling the air conditioner **300**A from remote locations inside or outside of the room. The smartphone **400** can send and receive data to and from the server **100** via a wireless connection.

The server **100** can send and receive data to and from the controller **200**A and the smartphone **400** over a network such as the Internet, and LAN (Local Area Network).

<Brief Overview of Network System Operation>

The following is a brief overview of the operation of the network system **1**A according to the present embodiment. FIG. **2** is a schematic diagram briefly representing the operation of the network system **1**A according to the present embodiment.

Referring to FIGS. **1** and **2**, the server **100** sends the controller **200**A an instruction for requesting a notification property concerning the air conditioner **300**A (step S**106**). For example, the server **100** sends the controller **200**A data for designating the property necessary for displaying on a remote control screen of the smartphone **400**. The server **100** may send the controller **200**A a designation of the necessary notification property according to an instruction from an air conditioner control application of the smartphone **400** (step S**120**).

The controller **200**A receives from the server **100** the instruction for designating the notification property. Other main roles of the controller **200**A include waiting for control instructions from the smartphone **400** and the server **100**, and sending the data to the air conditioner **300**A.

The air conditioner **300**A sends various notification properties to the controller **200**A either on a regular basis or upon accepting a control instruction from devices such as a switch and a remote controller (step S**108**). In the present embodiment, the communications between the air conditioner **300**A and the controller **200**A are based on the ECHONET Lite communications protocol.

From among the various notification properties received from the air conditioner **300**A, the controller **200**A sends the server **100** the notification property predesignated by the server **100** (step S**110**).

In the network system **1**A according to the present embodiment, the controller **200**A does not send a notification property to the server **100** in the initial state, specifically when the controller **200**A or the air conditioner **300**A has just been newly installed and the server **100** has not designated any notification property. Alternatively, in the initial state, the controller **200**A sends the server **100** only information such as power ON/OFF information (step S**122**).

The server **100** receives the designated notification property from the controller **200**A. By using the notification property, the server **100** sends the latest status information concerning the air conditioner **300**A to the smartphone **400** associated with the sending controller **200**A or air conditioner **300**A (step S**112**).

Specifically, in the present embodiment, for example, the server **100** receives a plurality of notification properties from a plurality of air conditioners **300**A and controllers **200**A disposed in different homes, as shown in FIG. **3**. To be more specific, the server **100** receives large numbers of notification properties from air conditioners **300**A disposed in different homes, offices, buildings, companies, and regions.

In network systems of related art, there is a high possibility of creating heavy traffic from the air conditioners **300**A to the server **100**, or overloading the server **100**. In the present embodiment, however, not all notification properties sent from the air conditioner **300**A to the controller **200**A are sent to the server **100**, and the possibility of creating heavy traffic from the air conditioners **300**A to the server **100**, or the possibility of overloading the server **100** can be reduced.

The following describes the specific configuration of the network system **1**A for realizing such functions.

<Hardware Configuration of Server **100**>

The following describes an aspect of the hardware configuration of the server **100**. FIG. **4** is a block diagram representing the hardware configuration of the server **100** according to the present embodiment.

Referring to FIG. **4**, the main constituting elements of the server **100** include a processor **110**, a memory **120**, an input/output unit **130**, and a communication interface **160**.

The processor **110** controls each part of the server **100** by running programs stored in the memory **120** or in external storage media. Specifically, the processor **110** runs the programs stored in the memory **120**, and performs various programs, as will be described later.

The memory **120** is realized by various types of memory, including, for example, RAM (Random Access Memory), ROM (Read-Only Memory), and flash memory. The memory **120** may also be realized by, for example, storage media used with an interface, including, for example, USB (Universal Serial Bus®) memory, CD (Compact Disc), DVD (Digital Versatile Disk), memory card, hard disk, IC (Integrated Circuit) card, optical memory card, mask ROM, EPROM (Erasable Programmable Read Only Memory), and EEPROM (Electronically Erasable Programmable Read-Only Memory).

The memory **120** stores information such as programs run by the processor **110**, data generated after the execution of a program by the processor **110**, data for controlling the air conditioner **300**A, data to be sent to the smartphone **400**, input data via the input/output unit **130**, data from the controller **200**A, and data from the smartphone **400**.

The input/output unit **130** accepts an instruction from an administrator, and enters the instruction in the processor **110**. The input/output unit **130** outputs characters, images, and sounds by using signals from the processor **110**.

The communication interface **160** is realized by various communications modules, including, for example, wireless

LAN communications such as IEEE 802.11a/b/g/n/ac, ZigBee®, and BlueTooth® and wired LAN such as Ethernet®. The communication interface **160** is provided for data exchange with other devices over wired communications or wireless communications. The processor **110** receives programs, control instructions, image data, text data, sound data, and other such information from the controller **200**A and the smartphone **400**, and sends information such as image data, text data, and sound data to these and other devices via the communication interface **160**.

The processor **110** via the communication interface **160** may constantly connect to the controller **200**A by using a communication protocol such as WebSocket.

For example, the processor **110** accepts a designation of the notification property necessary for the control of the air conditioner **300**A from either an administrator via the input/output unit **130** or the smartphone **400** via the communication interface **160**. The processor **110** sends information necessary to designate the notification property to the controller **200**A via the communication interface **160**. The processor **110** receives the designated notification property from the controller **200**A via the communication interface **160**. By using the notification property from the controller **200**A, the processor **110** creates data to be sent to the smartphone **400**, and sends the data to the smartphone **400** via the communication interface **160**.

<Hardware Configuration of Controller **200**A>

The following describes an aspect of the hardware configuration of the controller **200**A. FIG. **5** is a block diagram representing the hardware configuration of the controller **200**A according to the present embodiment.

Referring to FIG. **5**, the main constituting elements of the controller **200**A include a processor **210**, a memory **220**, an input/output unit **230**, and a communication interface **260**.

The processor **210** controls each part of the controller **200**A by running programs stored in the memory **220** or in external storage media. Specifically, the processor **210** runs the programs stored in the memory **220**, and performs various programs, as will be described later with reference to FIGS. **6**, **13**, and **18**.

The memory **220** is realized by various types of memory, including, for example, RAM, ROM, and flash memory. The memory **220** may also be realized by, for example, storage media used with an interface, including, for example, USB® memory, CD, DVD, memory card, hard disk, IC card, optical memory card, mask ROM, EPROM, and EEPROM.

The memory **220** stores information such as programs run by the processor **210**, data generated after the execution of a program by the processor **210**, and data **221** indicative of the designated notification property from the server **100**.

The input/output unit **230** accepts an instruction from a user, and enters the instruction in the processor **210**. The input/output unit **230** outputs characters, images, sounds, and LED light by using signals from the processor **210**.

The communication interface **260** is realized by various communications modules, including, for example, wireless LAN communications such as IEEE 802.11a/b/g/n/ac, ZigBee®, and BlueTooth® and wired LAN such as Ethernet®. The communication interface **260** is provided for data exchange with other devices over wired communications or wireless communications. For example, the processor **210** receives programs, control instructions, image data, text data, sound data, and other such information from other devices such as the server **100** and the air conditioner **300**A, and sends information such as image data, text data, and sound data to these and other devices via the communication interface **260**.

The processor **210** via the communication interface **260** may constantly connect to the server **100** and the home appliances by using a communication protocol such as WebSocket.

<Communication Process by Controller **200**A>

The following describes the communication process by the controller **200**A according to the present embodiment. FIG. **6** is a flowchart representing the communication process by the controller **200**A according to the present embodiment.

Referring to FIG. **6**, the processor **210** determines whether data has been received from other devices via the communication interface **260** (step S**152**). When in receipt of data (YES in step S**152**), the processor **210** determines whether the data is from the server **100** (step S**160**).

When in receipt of data from the server **100** (YES in step S**160**), the processor **210** accepts a designation of a notification property contained in the data (step S**162**). The processor **210** stores the designated notification property in the memory **220**. The processor **210** repeats the procedures from step S**152**.

When in receipt of data from the air conditioner **300**A (NO in step S**160**), the processor **210** extracts the notification property designated by the server **100** from the plurality of notification properties sent from the air conditioner **300**A (step S**164**). The processor **210** sends the extracted property to the server **100** via the communication interface **260** (step S**180**). The processor **210** repeats the procedures from step S**152**.

<Hardware Configuration of Air Conditioner **300**A>

The following describes an aspect of the hardware configuration of the air conditioner **300**A. FIG. **7** is a block diagram representing the hardware configuration of the air conditioner **300**A according to the present embodiment.

Referring to FIG. **7**, the main constituting elements of the air conditioner **300**A include a processor **310**, a memory **320**, an input/output unit **330**, a communication interface **360**, and a home appliance control unit **370**.

The processor **310** controls each part of the air conditioner **300**A by running programs stored in the memory **320** or in external storage media. Specifically, the processor **310** runs the programs stored in the memory **320**, and performs various programs.

The input/output unit **330** accepts an instruction from a user, and enters the instruction in the processor **310**. The input/output unit **330** outputs characters, images, sounds, and LED light by using signals from the processor **310**.

The communication interface **360** is realized by various communications modules, including, for example, wireless LAN communications such as IEEE 802.11a/b/g/n/ac, ZigBee®, and BlueTooth® and wired LAN such as Ethernet®. The communication interface **360** is provided for data exchange with other devices over wired communications or wireless communications. The processor **310** receives programs, control instructions, image data, text data, sound data, and other such information from other devices such as the smartphone **400**, and sends information such as image data, text data, and sound data to other devices such as the controller **200**A via the communication interface **360**. For example, the processor **310** sends the controller **200**A information such as an instruction sent from a remote controller, and information detected by a sensor. The information is sent via the communication interface **360** by using the ECHONET Lite communication protocol.

The home appliance control unit **370** controls the motor, the actuator, and other parts of the air conditioner **300**A as instructed by the processor **310**.

<Hardware Configuration of Smartphone **400**>

The following describes an aspect of the hardware configuration of the smartphone **400**. FIG. **8** is a block diagram representing the hardware configuration of the smartphone **400** according to the present embodiment.

Referring to FIG. **8**, the main constituting elements of the smartphone **400** include a processor **410**, a memory **420**, a touch panel **450** (a display **430** and a pointing device **440**), a communication interface **460**, and a speaker **470**.

The processor **410** controls each part of the smartphone **400** by running programs stored in the memory **420** or in external storage media. Specifically, the processor **410** runs the programs stored in the memory **420**, and performs various programs.

The memory **420** is realized by various types of memory, including, for example, RAM, ROM, and flash memory. The memory **420** may also be realized by, for example, storage media used with an interface, including, for example, USB® memory, CD, DVD, memory card, hard disk, IC card, optical memory card, mask ROM, EPROM, and EEPROM.

The memory **420** stores information such as programs run by the processor **410**, data generated after the execution of a program by the processor **410**, and data received from the server **100**.

The display **430** outputs characters and images by using signals from the processor **410**. The pointing device **440** accepts a user instruction, and inputs the instruction to the processor **410**. In the present embodiment, the touch panel **450** used by the smartphone **400** is a combination of the display **430** and the pointing device **440**.

The communication interface **460** is realized by various communications modules, including, for example, wireless LAN communications such as IEEE 802.11a/b/g/n/ac, ZigBee®, and BlueTooth® and wired LAN such as Ethernet®. The communication interface **460** is provided for data exchange with other devices over wired communications or wireless communications.

For example, the processor **410** operates as follows according to an air conditioner control application program. The processor **410** receives the predetermined notification property from the server **100** via the communication interface **460**. By using the received notification property, the processor **410** makes the touch panel **450** display a screen for controlling the air conditioner **300**A. The processor **410** accepts entry of a control instruction for the air conditioner **300**A via the touch panel **450**. The processor **410** sends the entered control instruction to the server **100** via the communication interface **460**.

In the present embodiment, the processor **410** downloads an application program for remote controlling the air conditioner **300**A, via the communication interface **460**. The processor **410** may send a designation of a notification property to the server **100** via the communication interface **460** by using an air conditioner control application program. For example, the processor **410** sends the server **100** information for designating only the notification property necessary for the application program from among the notification properties specified by the rules concerning ECHONET Lite.

As described above, in the network system **1**A according to the present embodiment, the controller **200**A sends the server **100** only the notification property designated by the server **100**, and can reduce the possibility of creating heavy traffic from the controller **200**A to the server **100**, or the possibility of overloading the server **100**.

Second Embodiment

The following describes Second Embodiment. First Embodiment described the case where the home appliance is the air conditioner **300**A. The present embodiment describes an example in which the home appliance is a refrigerator **300**B.

<Overall Configuration of Network System>

The overall configuration of the network system **1**B according to the present embodiment is described below. FIG. **9** is a schematic diagram representing the overall configuration of the network system **1**B according to the present embodiment.

Referring to FIG. **9**, the network system **1**B according to the present embodiment includes the refrigerator **300**B disposed as a home appliance in locations such as homes and offices, a controller **200**B provided as a first terminal that enables data communications with the refrigerator **300**B, a server **100** that enables data communications with the controller **200**B, and a smartphone **400** provided as a second terminal that enables data communications with the server **100**.

<Brief Overview of Network System Operation>

The following is a brief overview of the operation of the network system **1**B according to the present embodiment. FIG. **10** is a schematic diagram briefly representing the operation of the network system **1**B according to the present embodiment.

Referring to FIG. **10**, the server **100** sends the controller **200**B a designation of a notification property concerning the refrigerator **300**B (step S**106**). For example, the server **100** sends the controller **200**B data for designating the property necessary for displaying on a remote control screen of the smartphone **400**. The server **100** may send the necessary property to the controller **200**B by using an instruction from a refrigerator control application from the smartphone **400** (step S**120**).

The controller **200**B receives from the server **100** the instruction for designating the notification property. Other main roles of the controller **200**B include receiving control instructions from the smartphone **400** and the server **100**, and sending the data to the refrigerator **300**B.

The refrigerator **300**B sends various notification properties to the controller **200**B either on a regular basis or upon accepting a control instruction from devices such as a switch and a remote controller (step S**108**). In the present embodiment, the communications between the refrigerator **300**B and the controller **200**B are based on the ECHONET Lite communications protocol.

From among the various notification properties received from the refrigerator **300**B, the controller **200**B sends the server **100** the notification property predesignated by the server **100** (step S**110**).

In the network system **1**B according to the present embodiment, the controller **200**B does not send a notification property to the server **100** in the initial state, specifically when the controller **200**B or the refrigerator **300**B has just been newly installed, and the server **100** has not designated any notification property. Alternatively, in the initial state, the controller **200**B sends the server **100** only information such as power ON/OFF information (step S**122**).

The server **100** receives the designated notification property from the controller **200**B. By using the notification property, the server **100** sends the latest status information concerning the refrigerator **300**B to the smartphone **400** associated with the sending controller **200**B or refrigerator **300**B (step S**112**).

Specifically, in the present embodiment, the server **100** receives a plurality of notification properties from a plurality of refrigerators and controllers disposed in different homes, as shown in the network system of FIG. **3**. To be more

specific, the server **100** receives large numbers of notification properties from refrigerators disposed in different homes, offices, buildings, companies, and regions.

In network systems of related art, there is a high possibility of creating heavy traffic from the refrigerator **300**B to the server **100**, or overloading the server **100**. In the present embodiment, however, not all notification properties sent from the refrigerator **300**B to the controller **200**B are sent to the server **100**, and the possibility of creating heavy traffic from the refrigerator **300**B to the server **100**, or the possibility of overloading the server **100** can be reduced.

The specific configuration of the network system **1**B is the same as that described in First Embodiment, and will not be described.

Third Embodiment

The following describes Third Embodiment. First and Second Embodiments described the case where the server **100** designates which type of notification property to send from the controller **200**A or **200**B. In the present embodiment, however, the server **100** designates the timing for sending a notification property to the controller **200**A.

The overall configuration of the network system **1**C according to the present embodiment is described below. FIG. **11** is a schematic diagram representing the overall configuration of the network system **1**C according to the present embodiment.

Referring to FIG. **11**, the network system **1**C according to the present embodiment includes an air conditioner **300**A disposed as a home appliance in locations such as homes and offices, a controller **200**A provided as a first terminal that enables data communications with the air conditioner **300**A, a server **100** that enables data communications with the controller **200**A, and a smartphone **400** provided as a second terminal that enables data communications with the server **100**.

The following present embodiment will be described through the case where the home appliance is the air conditioner **300**A. However, the home appliance may be, for example, a refrigerator as in Fourth Embodiment, or some other device such as a vacuum cleaner, a television, a washing machine, a rice cooker, an air purifier, a floor heating system, and an IH (Induction Heating) cooking heater. The air conditioner **300**A can send and receive data to and from the controller **200**A via a wired or a wireless connection.

The present embodiment will be described through the case where the first terminal is the controller **200**A. The controller **200**A can send and receive data to and from the air conditioner **300**A via a wired or a wireless connection. The controller **200**A also can send and receive data to and from the server **100** via a wired or a wireless connection.

The present embodiment will be described through the case where the second terminal is the smartphone **400**. The smartphone **400** can send and receive data to and from the server **100** via a wireless connection.

The server **100** can send and receive data to and from the controller **200**A and the smartphone **400** over a network such as the Internet, and LAN.

<Brief Overview of Network System Operation>

The following is a brief overview of the operation of the network system **1**C according to the present embodiment. FIG. **12** is a schematic diagram briefly representing the operation of the network system **1**C according to the present embodiment.

Referring to FIG. **12**, the server **100** sends the controller **200**A data for designating the timing at which the controller **200**A sends a notification property concerning the air conditioner **300**A (step S**206**). For example, the server **100** sends the controller **200**A a time interval for obtaining the property necessary for displaying on a remote control screen of the smartphone **400**. Specifically, the server **100** instructs the controller **200**A to wait several minutes to several ten minutes, instead of instructing the controller **200**A to immediately forward data as is normally the case. The server **100** may send a designation of a send timing to the controller **200**A by using an instruction from an air conditioner control application from the smartphone **400** (step S**220**).

The controller **200**A receives the designation of the notification property send interval from the server **100**. Other main roles of the controller **200**A include receiving control instructions from the smartphone **400** and the server **100**, and sending the data to the air conditioner **300**A.

The air conditioner **300**A sends various notification properties to the controller **200**A either on a regular basis or upon accepting a control instruction from devices such as a switch and a remote controller (step S**208**). In the present embodiment, the communications between the air conditioner **300**A and the controller **200**A are based on the ECHONET Lite communications protocol.

Upon receiving various notification properties from the air conditioner **300**A (step S**208**), the controller **200**A sends the currently accumulated notification properties at the timing designated by the server **100** (step S**210**).

In the network system **1**C according to the present embodiment, the controller **200**A does not send a notification property to the server **100** in the initial state, specifically when the controller **200**A or the air conditioner **300**A has just been newly installed, and the server **100** has not designated any notification property. Alternatively, in the initial state, the controller **200**A sends the server **100** only information such as power ON/OFF information (step S**222**).

The server **100** receives only the notification property from the controller **200**A at the designated timing. The server **100** sends the latest status information concerning the air conditioner **300**A to the smartphone **400** associated with the sending controller **200**A or air conditioner **300**A (step S**212**).

Specifically, in the present embodiment, for example, the server **100** receives a plurality of notification properties from a plurality of air conditioners **300**A and controllers **200**A disposed in different homes, as shown in FIG. **3**. To be more specific, the server **100** receives large numbers of notification properties from air conditioners **300**A disposed in different homes, offices, buildings, companies, and regions.

In network systems of related art, there is a high possibility of creating heavy traffic from the air conditioners **300**A to the server **100**, or overloading the server **100**. In the present embodiment, however, the frequency of sending the notification property is reduced, or more than one notification property is sent to the server **100** at once. This makes it possible to reduce the possibility of creating heavy traffic from the air conditioners **300**A to the server **100**, or the possibility of overloading the server **100**.

The following describes the specific configuration of the network system **1**C for realizing such functions.

<Hardware Configuration of Server **100**>

The hardware configuration of the server **100** is substantially the same as that described in First Embodiment (see FIG. **4**), and the following describes only a specific example of the operation of the processor **110**.

For example, the processor **110** accepts a designation of the send interval of a notification property of the air conditioner **300**A from an administrator via the input/output unit **130**, or from the smartphone **400** via the communication interface **160**. For example, the processor **110** sends information indicative of the notification property send interval to the controller **200**A via the communication interface **160**. The processor **110** receives the notification property from the controller **200**A via the communication interface **160**. By using the notification property from the controller **200**A, the processor **110** creates data to be sent to the smartphone **400**, and sends the data to the smartphone **400** via the communication interface **160**.

<Hardware Configuration of Controller **200**A>

The hardware configuration of the controller **200**A is substantially the same as that described in First Embodiment (see FIG. **5**), and the following describes only a specific example of the operation of the processor **210**.

<Communication Process by Controller **200**A>

The following describes the communication process by the controller **200**A according to the present embodiment. FIG. **13** is a flowchart representing the communication process by the controller **200**A according to the present embodiment.

Referring to FIG. **13**, the processor **210** determines whether data has been received from other devices via the communication interface **260** (step S**252**). When in receipt of data (YES in step S**252**), the processor **210** determines whether the data is from the server **100** (step S**270**).

When in receipt of data from the server **100** (YES in step S**270**), the processor **210** accepts a designation of a notification property send interval contained in the data (step S**272**). Specifically, the processor **210** stores in the memory **220** the send interval designated by the server **100**. The processor **210** repeats the procedures from step **252**.

When in receipt of data from the air conditioner **300**A (NO in step S**270**), the processor **210** refers to the timer value (not shown), and determines whether the designated send interval has elapsed from the last time a notification property was sent to the server **100** (step S**274**). If it is determined that the designated send interval has not elapsed since the last sending of a notification property to the server **100** (NO in step S**274**), the processor **210** accumulates the notification property from the air conditioner **300**A in the memory **220** (step S**276**). The processor **210** repeats the procedures from step S**252**.

If it is determined that the designated send interval has elapsed from the last time a notification property was sent to the server **100** (YES in step S**274**), the processor **210** sends the accumulated notification properties to the server **100** via the communication interface **260** (step S**280**). The processor **210** repeats the procedures from step S**252**. Specifically, the processor **210** resets the timer.

<Hardware Configuration of Air Conditioner **300**A>

The hardware configuration of the air conditioner **300**A is substantially the same as that described in First Embodiment (see FIG. **7**), and will not be described.

<Hardware Configuration of Smartphone **400**>

The hardware configuration of the smartphone **400** is substantially the same as that described in First Embodiment (see FIG. **8**), and will not be described.

As described above, in the network system **1**C according to the present embodiment, the controller **200**A sends the notification property to the server **100** at the send interval designated by the server **100**. This makes it possible to reduce the possibility of creating heavy traffic from the controller **200**A to the server **100**, or the possibility of overloading the server **100**.

Fourth Embodiment

The following describes Fourth Embodiment. Third Embodiment described the case where the home appliance is the air conditioner **300**A. The present embodiment describes an example in which the home appliance is a refrigerator **300**B.

<Overall Configuration of Network System>

The overall configuration of the network system **1**D according to the present embodiment is described below. FIG. **14** is a schematic diagram representing the overall configuration of the network system **1**D according to the present embodiment.

Referring to FIG. **14**, the network system **1**D according to the present embodiment includes the refrigerator **300**B disposed as a home appliance in locations such as homes and offices, a controller **200**B provided as a first terminal that enables data communications with the refrigerator **300**B, a server **100** that enables data communications with the controller **200**B, and a smartphone **400** provided as a second terminal that enables data communications with the server **100**.

<Brief Overview of Network System Operation>

The following is a brief overview of the operation of the network system **1**D according to the present embodiment. FIG. **15** is a schematic diagram briefly representing the operation of the network system **1**D according to the present embodiment.

Referring to FIG. **15**, the server **100** sends the controller **200**B data for designating the timing at which the controller **200**B sends a notification property concerning the refrigerator **300**B (step S**206**). For example, the server **100** sends the controller **200**B a time interval for obtaining the property necessary for displaying on a remote control screen of the smartphone **400**. Specifically, the server **100** instructs the controller **200**B to wait several minutes to several ten minutes, instead of instructing the controller **200**B to immediately forward data as is normally the case. The server **100** may send the send timing to the controller **200**B by using an instruction from a refrigerator control application from the smartphone **400** (step S**220**).

The controller **200**B receives the designation of the notification property send interval from the server **100**. Other main roles of the controller **200**B include receiving control instructions from the smartphone **400** and the server **100**, and sending the data to the refrigerator **300**B.

The refrigerator **300**B sends various notification properties to the controller **200**B at a designated timing (step S**208**). In the present embodiment, the communications between the refrigerator **300**B and the controller **200**B are based on the ECHONET Lite communications protocol.

Upon receiving various notification properties from the refrigerator **300**B (step S**208**), the controller **200**B sends only the currently stored notification properties at the timing designated by the server **100** (step S**210**).

In the network system **1**D according to the present embodiment, the controller **200**B does not send a notification property to the server **100** in the initial state, specifically when the controller **200**B or the refrigerator **300**B has just been newly installed, and the server **100** has not designated any notification property. Alternatively, in the initial state, the controller **200**B sends the server **100** only information such as power ON/OFF information (step S**222**).

The server **100** receives the notification properties from the controller **200**B at the designated timing. The server **100** sends the latest status information concerning the refrigerator **300**B to the smartphone **400** associated with the sending controller **200**B or refrigerator **300**B based on the notification properties (step S**212**).

Specifically, in the present embodiment, for example, the server **100** receives a plurality of notification properties from a plurality of refrigerators and controllers disposed in different homes, as shown in FIG. **3**. To be more specific, the server **100** receives large numbers of notification properties from refrigerators disposed in different homes, offices, buildings, companies, and regions.

In network systems of related art, there is a high possibility of creating heavy traffic from the refrigerator **300**B to the server **100**, or overloading the server **100**. In the present embodiment, however, the frequency of sending the notification property is reduced, or more than one notification property is sent to the server **100** at once. This makes it possible to reduce the possibility of creating heavy traffic from the refrigerator **300**B to the server **100**, or the possibility of overloading the server **100**.

The specific configuration of the network system **1**D is the same as that described in Third Embodiment, and will not be described.

Fifth Embodiment

The following describes Fifth Embodiment. In First and Second Embodiments, the server **100** designates which notification property to send from the controller **200**A or **200**B. In Third and Fourth Embodiments, the server designates a send timing for the notification property to be sent from the controller **200**A. In the present embodiment, however, the server **100** designates the type of notification property to be sent from the controller **200**A, and a timing for sending the notification property.

The overall configuration of the network system **1**E according to the present embodiment is described below. FIG. **16** is a schematic diagram representing the overall configuration of the network system **1**E according to the present embodiment.

Referring to FIG. **16**, the network system **1**E according to the present embodiment includes an air conditioner **300**A disposed as a home appliance in locations such as homes and offices, a controller **200**A provided as a first terminal that enables data communications with the air conditioner **300**A, a server **100** that enables data communications with the controller **200**A, and a smartphone **400** provided as a second terminal that enables data communications with the server **100**.

The following present embodiment will be described through the case where the home appliance is the air conditioner **300**A. However, the home appliance may be, for example, a refrigerator as in Sixth Embodiment, or some other device such as a vacuum cleaner, a television, a washing machine, a rice cooker, an air purifier, a floor heating system, and an IH (Induction Heating) cooking heater. The air conditioner **300**A can send and receive data to and from the controller **200**A via a wired or a wireless connection.

The present embodiment will be described through the case where the first terminal is the controller **200**A. The controller **200**A can send and receive data to and from the air conditioner **300**A via a wired or a wireless connection. The controller **200**A also can send and receive data to and from the server **100** via a wired or a wireless connection.

The present embodiment will be described through the case where the second terminal is the smartphone **400**. The smartphone **400** can send and receive data to and from the server **100** via a wireless connection.

The server **100** can send and receive data to and from the controller **200**A and the smartphone **400** over a network such as the Internet, and LAN.

<Brief Overview of Network System Operation>

The following is a brief overview of the operation of the network system **1**E according to the present embodiment. FIG. **17** is a schematic diagram briefly representing the operation of the network system **1**E according to the present embodiment.

Referring to FIG. **17**, the server **100** sends the controller **200**A data for designating the notification property to be sent from the controller **200**A concerning the air conditioner **300**A, and data for designating the send timing of the notification property (step S**306**). For example, the server **100** sends the controller **200**A a designation of a notification property for displaying on a remote control screen of the smartphone **400**, and a designation of a timing for obtaining the notification property. The server **100** may send a designation of a notification property and a designation of a send timing to the controller **200**A, by using an instruction from an air conditioner control application from the smartphone **400** (step S**320**).

The controller **200**A accepts the designation of a notification property and the designation of a send timing from the server **100**. Other main roles of the controller **200**A include receiving control instructions from the smartphone **400** and the server **100**, and sending the data to the air conditioner **300**A.

The air conditioner **300**A sends various notification properties to the controller **200**A either on a regular basis or upon accepting a control instruction from devices such as a switch and a remote controller (step S**308**). In the present embodiment, the communications between the air conditioner **300**A and the controller **200**A are based on the ECHONET Lite communications protocol.

Upon receiving various notification properties from the air conditioner **300**A (step S**308**), the controller **200**A sends only the designated property from among the currently stored notification properties at the timing designated by the server **100** (step S**310**).

In the network system **1**E according to the present embodiment, the controller **200**A does not send a notification property to the server **100** in the initial state, specifically when the controller **200**A or the air conditioner **300**A has just been newly installed, and the server **100** has not designated any notification property. Alternatively, in the initial state, the controller **200**A sends the server **100** only information such as power ON/OFF information (step S**322**).

The server **100** receives only the designated notification property from the controller **200**A at the designated timing. By using the received notification property, the server **100** sends the latest status information concerning the air conditioner **300**A to the smartphone **400** associated with the sending controller **200**A or air conditioner **300**A (step S**312**).

Specifically, in the present embodiment, for example, the server **100** receives a plurality of notification properties from a plurality of air conditioners **300**A and controllers **200**A disposed in different homes, as shown in FIG. **3**. To be more specific, the server **100** receives large numbers of notification properties from air conditioners **300**A disposed in different homes, offices, buildings, companies, and regions.

In network systems of related art, there is a high possibility of creating heavy traffic from the air conditioner **300**A to the server **100**, or overloading the server **100**. In the present embodiment, however, the type of notification property itself, and the frequency of sending the notification property are reduced, or more than one notification property is sent to the server **100** at once. This makes it possible to reduce the possibility of creating heavy traffic from the air conditioner **300**A to the server **100**, or the possibility of overloading the server **100**.

The following describes the specific configuration of the network system **1**E for realizing such functions.

<Hardware Configuration of Server **100**>

The hardware configuration of the server **100** is substantially the same as that described in First Embodiment (see FIG. **4**), and the following describes only a specific example of the operation of the processor **110**.

For example, the processor **110** accepts a designation of a notification property of the air conditioner **300**A, and a designation of a send interval of the notification property from an administrator via the input/output unit **130**, or from the smartphone **400** via the communication interface **160**. For example, the processor **110** sends the controller **200**A information indicative the notification property to be sent, and information indicative of a notification property send interval via the communication interface **160**. The processor **110** receives the notification property from the controller **200**A via the communication interface **160**. By using the notification property from the controller **200**A, the processor **110** creates data to be sent to the smartphone **400**, and sends the data to the smartphone **400** via the communication interface **160**.

<Hardware Configuration of Controller **200**A>

The hardware configuration of the controller **200**A is substantially the same as that described in First Embodiment (see FIG. **5**), and the following describes only a specific example of the operation of the processor **210**.

<Communication Process by Controller **200**A>

The following describes the communication process by the controller **200**A according to the present embodiment. FIG. **18** is a flowchart representing the communication process by the controller **200**A according to the present embodiment.

Referring to FIG. **18**, the processor **210** determines whether data has been received from other devices via the communication interface **260** (step S**352**). When in receipt of data (YES in step S**352**), the processor **210** determines whether the data is from the server **100** sent to designate the notification property to be sent (step S**360**).

When the data is from the server **100** sent to designate the notification property to be sent (YES in step S**360**), the processor **210** stores the designated notification property in the memory **220** (step S**362**). The processor **210** repeats the procedures from step **352**.

When the data is not from the server **100** sent to designate the notification property to be sent (NO in step S**360**), the processor **210** determines whether the data is from the server **100** sent to designate a notification property send interval (step S**370**).

When the data is from the server **100** sent to designate a notification property send interval (YES in step S**370**), the processor **210** stores the designated send interval in the memory **220** (step S**372**). The processor **210** repeats the procedures from step S**352**.

When the data is not from the server **100** sent to designate a notification property send interval (NO in step S**370**), the processor **210** refers to the time value (not shown), and determines whether the designated send interval has elapsed from the last time a notification property was sent to the server **100** (step S**374**). If it is determined that the designated send interval has not elapsed since the last sending of a notification property to the server **100** (NO in step S**374**), the processor **210** stores the notification property from the air conditioner **300**A in the memory **220** (step S**376**). Specifically, the processor **210** accumulates in the memory **220** the notification properties sent from the air conditioner **300**A and designated by the server **100** until the designated send interval has elapsed since the last sending of a notification property to the server **100** (step S**376**). The processor **210** repeats the procedures from step S**352**.

If it is determined that the designated send interval has elapsed since the last sending of the notification property to the server **100** (YES in step S**374**), the processor **210** sends the accumulated notification properties to the server **100** (step S**380**). The processor **210** repeats the procedures from step S**352**.

<Hardware Configuration of Air Conditioner **300**A>

The hardware configuration of the air conditioner **300**A is substantially the same as that described in First Embodiment (see FIG. **7**), and will not be described.

<Hardware Configuration of Smartphone **400**>

The hardware configuration of the smartphone **400** is substantially the same as that described in First Embodiment (see FIG. **8**), and will not be described.

As described above, in the network system **1**E according to the present embodiment, the controller **200**A sends the designated notification property to the server **100** at the send interval designated by the server **100**. This makes it possible to reduce the possibility of creating heavy traffic from the controller **200**A to the server **100**, or the possibility of overloading the server **100**.

Sixth Embodiment

The following describes Sixth Embodiment. Fifth Embodiment described the case where the home appliance is the air conditioner **300**A. The present embodiment describes an example in which the home appliance is a refrigerator **300**B.

<Overall Configuration of Network System>

The overall configuration of the network system **1**F according to the present embodiment is described below. FIG. **19** is a schematic diagram representing the overall configuration of the network system **1**F according to the present embodiment.

Referring to FIG. **19**, the network system **1**F according to the present embodiment includes a refrigerator **300**B disposed as a home appliance in locations such as homes and offices, a controller **200**B provided as a first terminal that enables data communications with the refrigerator **300**B, a server **100** that enables data communications with the controller **200**B, and a smartphone **400** provided as a second terminal that enables data communications with the server **100**.

<Brief Overview of Network System Operation>

The following is a brief overview of the operation of the network system **1**F according to the present embodiment. FIG. **20** is a schematic diagram briefly representing the operation of the network system **1**F according to the present embodiment.

Referring to FIG. **20**, the server **100** sends the controller **200**B data for designating the notification property to be sent from the controller **200**B concerning the refrigerator **300**B, and data for designating the send timing of the notification

property (step S306). For example, the server **100** sends the controller **200**B a designation of a notification property for displaying on a remote control screen of the smartphone **400**, and a designation of a timing for obtaining the notification property. The server **100** may send a designation of a notification property and a designation of a send timing to the controller **200**B, by using an instruction from a refrigerator control application from the smartphone **400** (step S320).

The controller **200**B accepts the designation of a notification property and the designation of a send timing from the server **100**. Other main roles of the controller **200**B include receiving control instructions from the smartphone **400** and the server **100**, and sending the data to the refrigerator **300**B.

The refrigerator **300**B sends various notification properties to the controller **200**B either on a regular basis or upon accepting a control instruction from devices such as a switch and a remote controller (step S308). In the present embodiment, the communications between the refrigerator **300**B and the controller **200**B are based on the ECHONET Lite communications protocol.

Upon receiving various notification properties from the refrigerator **300**B (step S308), the controller **200**B sends only the designated property from among the currently stored notification properties at the timing designated by the server **100** (step S310).

In the network system **1**F according to the present embodiment, the controller **200**B does not send a notification property to the server **100** in the initial state, specifically when the controller **200**B or the refrigerator **300**B has just been newly installed, and the server **100** has not designated any notification property. Alternatively, in the initial state, the controller **200**B sends the server **100** only information such as power ON/OFF information (step S322).

The server **100** receives only the designated notification property from the controller **200**B at the designated timing. By using the received notification property, the server **100** sends the latest status information concerning the refrigerator **300**B to the smartphone **400** associated with the sending controller **200**B or refrigerator **300**B (step S312).

Specifically, in the present embodiment, for example, the server **100** receives a plurality of notification properties from a plurality of refrigerators and controllers disposed in different homes, as shown in FIG. **3**. To be more specific, the server **100** receives large numbers of notification properties from refrigerators disposed in different homes, offices, buildings, companies, and regions.

In network systems of related art, there is a high possibility of creating heavy traffic from the refrigerator **300**B to the server **100**, or overloading the server **100**. In the present embodiment, however, the type of notification property itself, and the frequency of sending the notification property are reduced, or more than one notification property is sent to the server **100** at once. This makes it possible to reduce the possibility of creating heavy traffic from the refrigerator **300**B to the server **100**, or the possibility of overloading the server **100**.

The specific configuration of the network system **1**F is the same as that described in Fifth Embodiment, and will not be described.

Seventh Embodiment

The following describes Seventh Embodiment. In First, Third, and Fifth Embodiments, the server **100** provides services concerning the air conditioner **300**A. In Second, Fourth, and Sixth Embodiments, the server **100** provides services concerning the refrigerator **300**B. However, the server **100** may provide services concerning more than one type of home appliance, as in the present embodiment.

FIG. **21** is a schematic diagram representing the overall configuration of the network system **1**G according to the present embodiment. FIG. **22** is a functional block diagram representing the overall configuration of the network system **1**G according to the present embodiment.

Referring to FIGS. **21** and **22**, the network system **1**G according to the present embodiment includes an air conditioner **300**A, a refrigerator **300**B, and a washing machine **300**C disposed as home appliances in locations such as homes and offices, controllers **200**A, **200**B, and **200**C provided as first terminals that enable data communications with the home appliances, a server **100** that enables data communications with the controllers **200**A, **200**B, and **200**C, and a smartphone **400** provided as a second terminal that enables data communications with the server **100**.

The overall operation and the specific configuration of the network system **1**G will not be described because these are a combination of the overall operations of First, Third, and Fifth Embodiments, the overall operations of Second, Fourth, and Sixth Embodiments, and the overall operation of the washing machine **300**C. Specifically, the server **100** in the network system **1**G according to the present embodiment serves as the servers **100** of First, Third, and Fifth Embodiments, the servers **100** of Second, Fourth, and Sixth Embodiments, and the server **100** associated with the washing machine **300**C.

In the present embodiment, the controllers **200**A, **200**B, and **200**C provided for the home appliances **300**A, **300**B, and **300**C, respectively. For example, the home appliances **300**A, **300**B, and **300**C and the controllers **200**A, **200**B, and **200**C perform communications in accordance with the ECHONET Lite specifications. The controllers **200**A, **200**B, and **200**C are connected to the server **100** via a router **600**. For example, the controllers **200**A, **200**B, and **200**C and the server **100** communicate in XML format for each service.

More specifically, the server **100** according to the present embodiment stores a designation of a notification property for each home appliance. Alternatively, the server **100** stores a designation of a notification property send interval for each home appliance. Alternatively, the server **100** stores a designation of a notification property and a designation of a send interval for each home appliance.

Eighth Embodiment

The following describes Eighth Embodiment. In the network system **1**G according to Seventh Embodiment, the controllers **200**A, **200**B, and **200**C are provided for the home appliances **300**A, **300**B, and **300**C, respectively.

However, as shown in FIGS. **23** and **24**, a single controller **200**D may be provided for the home appliances **300**A, **300**B, and **300**C. For example, the home appliances **300**A, **300**B, and **300**C and the controller **200**D communicate in accordance with the ECHONET Lite specifications. The controller **200**D and the server **100** communicate with each other in XML format for each service, for example.

The controller **200**D according to the present embodiment serves as the controllers **200**A of First, Third, and Fifth Embodiments, the controllers **200**B of Second, Fourth, and Sixth Embodiments, and the controller **200**C associated with the washing machine **300**C. Likewise, the server **100** in the network system **1**H according to the present embodiment serves as the servers **100** of First, Third, and Fifth Embodi-

ments, the servers **100** of Second, Fourth, and Sixth Embodiments, and the server **100** associated with the washing machine **300**C.

Specifically, the server **100** according to the present embodiment stores a designation of a notification property for each home appliance. Alternatively, the server **100** stores a designation of a notification property send interval for each home appliance. Alternatively, the server **100** stores a designation of a notification property and a designation of a send interval for each home appliance.

With the designation of a notification property by the server **100**, the processor **210** of the controller **200**D stores the notification property designated by the server **100**. This data is stored in the memory **220** for each home appliance. Here, the processor **210** extracts the notification property of the corresponding home appliance upon receiving notification property data from the home appliance. The processor **210** sends the extracted notification property to the server **100**.

Alternatively, with the designation of a notification property send interval by the server **100**, the processor **210** of the controller **200**D stores the notification property send interval designated by the server **100**. This data is stored in the memory **220** for each home appliance. Here, the processor **210** sends the notification property to the server **100** upon receiving notification property data from the home appliance, after the send interval corresponding to the home appliance has elapsed since the last sending of a notification property.

Alternatively, with the designation of a notification property and the designation of a send interval by the server **100**, the processor **210** of the controller **200**D stores the notification property and the send interval designated by the server **100**. This data is stored in the memory **220** for each home appliance. Here, the processor **210** extracts and accumulates the notification property of the corresponding home appliance upon receiving notification property data from the home appliance. The processor **210** then sends the notification property to the server **100** after the send interval corresponding to the home appliance has elapsed since the last sending of a notification property.

Ninth Embodiment

The following describes Ninth Embodiment. In the network systems according to Third to Sixth Embodiments, the controllers **200**A and **200**B send all the accumulated notification properties to the server **100**.

In the present embodiment, the processor **210** creates sending data by using the most recent notification property in the accumulated notification properties, as in step S**228** of FIG. **25**. The processor **210** sends the sending data to the server **100** (step S**230**). Other configurations and processes are the same as in Third and Fourth Embodiments, and will not be described.

Tenth Embodiment

The following describes Tenth Embodiment. In the network systems according to Third to Sixth Embodiments, the controllers **200**A and **200**B send all the accumulated notification properties to the server **100**.

In the present embodiment, the processor **210** creates sending data by using the most recent notification property in the designated notification properties from all the accumulated notification properties, as in step S**328** of FIG. **26**. The processor **210** sends the sending data to the server **100** (step S**330**). Other configurations and processes are the same as in Fifth and Sixth Embodiments, and will not be described.

Eleventh Embodiment

The following describes Eleventh Embodiment. In the network systems according to Third to Sixth Embodiments, the controllers **200**A and **200**B send all the accumulated notification properties to the server **100**.

In the present embodiment, the processor **210** creates sending data by combining the most recent notification properties from the plurality of notification properties contained in the accumulated notification properties, as in step S**228** of FIG. **25**. Specifically, the processor **210** creates and updates sending data by updating only the notification properties that had a change (notification property difference) in the plurality of accumulated notification properties. The processor **210** then sends the most recent combination based on the notification property difference to the server **100** (step S**230**). Other configurations and processes are the same as in Third and Fourth Embodiments, and will not be described.

Twelfth Embodiment

The following describes twelfth Embodiment. In the network systems according to Third to Sixth Embodiments, the controllers **200**A and **200**B send all the accumulated notification properties to the server **100**.

In the present embodiment, the processor **210** creates sending data by combining the most recent notification properties from the plurality of designated notification properties contained in the accumulated notification properties, as in step S**328** of FIG. **26**. Specifically, the processor **210** creates and updates sending data by updating only the notification properties that had a change (notification property difference) in the plurality of accumulated notification properties. The processor **210** then sends the most recent combination based on the notification property difference to the server **100** (step S**330**). Other configurations and processes are the same as in Third and Fourth Embodiments, and will not be described.

Thirteenth Embodiment

Thirteenth Embodiment is described below.

In the present embodiment, the processor **110** of the server **100** checks the load on the server **100** either on a regular basis or upon receiving a notification property from a home appliance. The processor **110** then sends the controllers **200**A and **200**B a designation instruction for sending a notification property when the load on the server **100** is at or above a predetermined value.

Alternatively, the processor **110** of the server **100** checks the load on the server **100** either on a regular basis or upon receiving a notification property from a home appliance. The processor **110** then sends the controllers **200**A and **200**B a designation instruction concerning a send timing such as a notification property send interval when the load on the server **100** is at or above a predetermined value. The memory **120** of the server **100** may store a plurality of predetermined values, and the processor **110** may increase the send interval in a stepwise fashion as the load increases.

Alternatively, the processor **110** of the server **100** checks the load on the server **100** either on a regular basis or upon receiving a notification property from a home appliance. The

processor **110** then sends the controllers **200**A and **200**B a designation instruction for sending a notification property, and a designation instruction concerning a send timing such as a notification property send interval when the load on the server **100** is at or above a predetermined value. The memory **120** of the server **100** may store a plurality of predetermined values, and the processor **110** may increase the send interval in a stepwise fashion as the load increases.

The processor **110** of the server **100** may designate the type of notification property to be sent, or the send interval of a notification property only for services, notification properties, or home appliances that are under a high load.

Fourteenth Embodiment

Fourteenth Embodiment is described below.

In the present embodiment, the processor **110** of the server **100** checks the reception frequency or the transmission frequency of a notification property within a predetermined time period, either on a regular basis or upon receiving a notification property from a home appliance. The processor then sends the controllers **200**A and **200**B a designation instruction for sending a notification property when the reception frequency or the transmission frequency of a notification property in the server **100** is at or above a predetermined value.

Alternatively, the processor **110** of the server **100** checks the reception frequency or the transmission frequency of a notification property within a predetermined time period, either on a regular basis or upon receiving a notification property from a home appliance. The processor then sends the controllers **200**A and **200**B a designation instruction concerning a send timing such as the send interval of a notification property when the reception frequency or the transmission frequency of a notification property in the server **100** is at or above a predetermined value. The memory **120** of the server **100** may store a plurality of predetermined values, and the processor **110** may increase the send interval in a stepwise fashion as the reception or transmission frequency increases.

Alternatively, the processor **110** of the server **100** checks the reception frequency or the transmission frequency of a notification property within a predetermined time period, either on a regular basis or upon receiving a notification property from a home appliance. The processor then sends the controllers **200**A and **200**B a designation instruction for sending a notification property, and a designation instruction concerning a send timing such as the send interval of a notification property when the reception frequency or the transmission frequency of a notification property in the server **100** is at or above a predetermined value. The memory **120** of the server **100** may store a plurality of predetermined values, and the processor **110** may increase the send interval in a stepwise fashion as the reception or transmission frequency increases.

The processor **110** of the server **100** may designate the type of notification property to be sent, or the send interval of a notification property only for services, notification properties, or home appliances for which the notification property reception or transmission frequency is high.

Fifteenth Embodiment

Fifteenth Embodiment is described below.

In the present embodiment, the processor **110** of the server **100** does not send a notification property designation and send instruction to the controllers **200**A and **200**B of paying members of a remote control service of a home appliance. Specifically, the embodiment may be implemented so that the server **100** does not send an instruction for inhibiting the sending of notification properties, when the controllers **200**A and **200**B are in a default setting that allows all the notification properties to be sent. Alternatively, the embodiment may be implemented so that the server **100** sends an instruction for sending all the notification properties, when the controllers **200**A and **200**B are in a default setting that does not allow sending of notification properties. Conversely, the processor **110** of the server **100** sends a notification property designation and send instruction to the controllers **200**A and **200**B of non-paying members of a remote control service of a home appliance. Specifically, the embodiment may be implemented so that the server **100** sends an instruction for inhibiting the sending of notification properties, when the controllers **200**A and **200**B are in a default setting that allows all the notification properties to be sent. Alternatively, the embodiment may be implemented so that the server **100** sends an instruction for sending a designated notification property, when the controllers **200**A and **200**B are in a default setting that does not allow sending of notification properties.

Alternatively, the processor **110** of the server **100** does not send a designation instruction concerning a send timing such as the send interval of a notification property to the controllers **200**A and **200**B of paying members of a remote control service of a home appliance. Specifically, the embodiment may be implemented so that the server **100** does not send an instruction for inhibiting the sending of notification properties when the controllers **200**A and **200**B are in a default setting that allows for sending of notification properties. Alternatively, the embodiment may be implemented so that the server **100** sends an instruction for sending a notification property at an arbitrary timing when the controllers **200**A and **200**B are in a default setting that does not allow sending of notification properties. Conversely, the processor **110** of the server **100** sends a designation instruction concerning a send timing such as the send interval of a notification property to the controllers **200**A and **200**B of non-paying members of a remote control service of a home appliance. Specifically, the embodiment may be implemented so that the server **100** sends an instruction for inhibiting the sending of notification properties when the controllers **200**A and **200**B are in a default setting that allows all the notification properties to be sent. Alternatively, the embodiment may be implemented so that the server **100** sends an instruction for sending a notification property at the designated time interval when the controllers **200**A and **200**B are in a default setting that does not allow sending of notification properties.

Alternatively, the processor **110** of the server **100** does not send a designation instruction for sending a notification property, or a designation instruction concerning a send timing such as the send interval of a notification property to the controllers **200**A and **200**B of paying members of a remote control service of a home appliance. Specifically, the embodiment may be implemented so that the server **100** does not send an instruction for inhibiting the sending of notification properties when the controllers **200**A and **200**B are in a default setting that allows for sending of notification properties, or that the server **100** sends an instruction for sending all the notification properties at an arbitrary timing when the controllers **200**A and **200**B are in a default setting that does not allow for sending of notification properties. Conversely, the processor **110** of the server **100** sends a designation instruction for sending a notification property, and a designation instruction concerning a send timing such

as the send interval of a notification property to the controllers **200**A and **200**B of non-paying members of a remote control service of a home appliance. Specifically, the embodiment may be implemented so that the server **100** sends an instruction for inhibiting the sending of notification properties when the controllers **200**A and **200**B are in a default setting that allows all the notification properties to be sent. Alternatively, the embodiment may be implemented so that the server **100** sends an instruction for sending a designated notification property at the designated time interval when the controllers **200**A and **200**B are in a default setting that does not allow sending of notification properties.

Examples of Other Applications

As is evident, the present invention also can be achieved by supplying a program to a system or a device. The advantages of the present invention also can be obtained with a computer (or a CPU or an MPU) in a system or a device upon the computer reading and executing the program code stored in the supplied storage medium (or memory) storing software programs intended to realize the present invention.

In this case, the program code itself read from the storage medium realizes the functions of the embodiments above, and the storage medium storing the program code constitutes the present invention.

Evidently, the functions of the embodiments above can be realized not only by a computer reading and executing such program code, but by some or all of the actual processes performed by the OS (operating system) or the like running on a computer under the instructions of the program code.

The functions of the embodiments above also can be realized by some or all of the actual processes performed by the CPU or the like of an expansion board or expansion unit under the instructions of the program code read from a storage medium and written into other storage medium provided in the expansion board inserted into a computer or the expansion unit connected to a computer.

The embodiments disclosed herein are to be considered in all aspects only as illustrative and not restrictive. The scope of the present invention is to be determined by the scope of the appended claims, not by the foregoing descriptions, and the invention is intended to cover all modifications falling within the equivalent meaning and scope of the scope of the claims set forth below.

What is claimed is:

1. A network system comprising at least one terminal and a server,

wherein the server sends said at least one terminal first information for designating a time interval for sending data to inhibit sending of data from said at least one terminal, and

wherein said at least one terminal each accumulates unsent data from the obtained data, creates data indicative of a difference in the plurality of accumulated data, and sends the data indicative of the difference to the server, according to the information from the server.

2. The network system according to claim **1**, wherein said at least one terminal sends the server only the most recent data in unsent data from the obtained data according to the first information.

3. The network system according to claim **1**, wherein the information sent from the server to said at least one terminal is second information for designating a type of data to be sent.

4. The network system according to claim **3**, wherein the server accepts a designation of a required data type from other terminal, and sends the second information to said at least one terminal according to the designated data type.

5. The network system according to claim **1**, wherein the server sends the information to said at least one terminal when a predetermined condition is satisfied, and does not send the information to said at least one terminal when the predetermined condition is not satisfied.

6. The network system according to claim **5**, wherein the server sends the information to said at least one terminal under the predetermined condition that a server load exceeds a predetermined value, and does not send the information to said at least one terminal under the predetermined condition that the server load does not exceed the predetermined value.

7. The network system according to claim **5**, wherein the server sends the information to said at least one terminal under the predetermined condition that the terminal is a terminal of a non-paying member, and does not send the information to said at least one terminal under the predetermined condition that the terminal is a terminal of a paying member.

8. A communication method for a network system that includes at least one terminal and a server,

the method comprising:

the server sending said at least one terminal first information for designating a time interval for sending data to inhibit sending of data from said at least one terminal; and

said at least one terminal each accumulating unsent data from obtained data, creating data indicative of a difference in the plurality of accumulated data, and sending the data indicative of the difference to the server, according to the information from the server.

9. A server comprising:

a communication interface for communicating with at least one terminal; and

a processor for sending said at least one terminal via the communication interface first information for designating a time interval for sending data to inhibit sending of data from said at least one terminal, and receiving from said at least one terminal via the communication interface data indicative of a difference in a plurality of accumulated data.

10. A communication method for a server that includes a processor and a communication interface,

the method comprising:

the processor sending said at least one terminal via the communication interface first information for designating a time interval for sending data to inhibit sending of data from said at least one terminal; and

the processor receiving from said at least one terminal via the communication interface data indicative of a difference in a plurality of accumulated data.

11. A terminal comprising:

a communication interface for communicating with a server; and

a processor for receiving from the server via the communication interface first information for designating a time interval for sending data to inhibit sending of data to the server, accumulating unsent data from the obtained data according to the information from the server, creating data indicative of a difference in the plurality of accumulated data, and sending the data indicative of the difference to the server via the communication interface.

12. A communication method for a terminal that includes a processor and a communication interface,

the method comprising:

the processor receiving from a server via the communication interface first information for designating a time interval for sending data to inhibit sending of data to the server;

the processor accumulating unsent data from the obtained data according to the information from the server;

the processor creating data indicative of a difference in the plurality of accumulated data; and

the processor sending the data indicative of the difference to the server via the communication interface.

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